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THE IMPACT OF HIGH VOLTAGE ELECTRIC TRANSMISSION LINES ON AGRICULTURAL LAND VALUES IN ALBERTA

by

© ROBERT RONALD THOMPSON

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF MASTER OF SCIENCE

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ABSTRACT

Conflict between the agricultural and energy industries regarding surface rights issues has increased in the late 1970's and early 1980's. This growing concern has led to landowner discontent regarding legislation concerning property rights, land use and compensation. The purpose of this study is to consider impacts which high voltage electric transmission lines (HVETL) may have on agricultural property values in south central Alberta. Primary data consisting of actual sales of property and landowner opinions are analyzed.

Results of this study show that HVETL may, depending upon specific circumstances, reduce the value of agricultural property. The most significant reduction in property value is observed for those properties which have irrigation potential. The value of property used in dryland agricultural production with no potential for irrigation does not appear to be reduced by the presence of an HVETL. This statement is especially so if the HVETL is located on the property boundary, no residences are located near the HVETL and annual compensation for loss of use and adverse effect is paid to the landowner.

Results from two questionnaries suggest that impact on rights varies with individual landowner perceptions, specific land uses and HVETL configurations. For example, a significantly higher proportion of landowners with a view of the Rocky Mountains, as compared to no mountain view, feel their aesthetic value is impacted. Another finding suggests that impact on specific rights on the same parcel vary. For example, all landowners of property encumbered by an HVETL feel their field operations are impacted while between 60 percent and 80 percent of landowners feel their aesthetic value is impacted by the HVETL. Given this varying impact, flexibility is desirable when planning routes, considering the method of estimating compensation, and considering the amount of compensation.

A number of policy considerations arise. Increased agricultural emphasis and involvement in route selection is suggested. Landowner discontent may be reduced if a choice of either annual payment or lump sum payment for value of the land is available. To further reduce discontent, inclusion of a clause which considers HVETL impact on a change in land use is suggested.

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TABLE OF CONTENTS

CHAPTER		PAGE
I	INTRODUCTION	1
	Problem	1
	Problem Background	3
	Scope of the Problem	6
	Purpose and Objectives of the Study	8
II	THEORY AND PROCESS	9
	External Diseconomies	9
	Property	11
	Agricultural Property Value	14
	Injurious Affection	18
	The Institutional Process	21
	Summary	24
III	STATISTICAL TECHNIQUES AND DATA COLLECTION	25
	Impact on Demand	25
	Statistical Techniques	30
	Data Collection	36
IV	DATA ANALYSIS AND RESULTS	46
	Sale Price Analysis	46
	Questionnaire Results of Encumbered Sales	64
	Questionnaire Results of Random Sample	72
	Comparison of Questionnaire Results	80
	Interpretation of Results	83

CHAPTER PAGE

V POLICY CONSIDERATIONS..... 85

Questionnaire Results..... 85

Ontario Hydro Compensation Policies..... 89

Recommendations..... 90

VI SUMMARY AND CONCLUSIONS..... 94

BIBLIOGRAPHY..... 99

APPENDIX I SALE PARTICIPANT QUESTIONNAIRE..... 106

APPENDIX II RANDOM SAMPLE QUESTIONNAIRE..... 111

APPENDIX III SALES PARTICIPANTS RESULTS..... 116

APPENDIX IV RANDOM SAMPLE RESULTS..... 118

APPENDIX V COMPARISON OF HVETL IMPACT..... 123

APPENDIX VI ONTARIO HYDRO'S COMPENSATION POLICY..... 127

LIST OF TABLES

TABLE		PAGE
3.1	Alberta Studies Researching Impact of HVETL on Agricultural Returns	28
3.2	Selected Characteristics of Four Regions in South Central Alberta	38
3.3	Selected Characteristics of the Power Lines Which Traverse the Four Regions	38
3.4	Number of Sales of Encumbered Properties Along the High River and Airdrie Regions	41
3.5	Number of Selected and Completed Questionnaires From the Randon Sample	41
3.6	Number of Completed Random Sample Questionnaires by Region	45
4.1	Appreciation Rates - 1976 to 1981 - for Two Regions	48
4.2	Results of Paired Comparison, One Best Comparable	49
4.3	Results of Paired Comparison, Average of Adjusted Comparables	49
4.4	Results of Paired Comparison, Similar Sales - No Adjustments	51
4.5	Results of Paired Comparison, One Best Comparable - Irrigation Potential	51
4.6	Variables Included in the Multiple Regression Analysis	54

TABLE PAGE

4.7 Results From Regression Equation #1..... 55

4.8 Results From Regression Equation #2..... 59

4.9 Results of Regressions with Various HVETL Variables, Regression Equations Three, Four, Five and Six..... 63

4.10 Results of Sales Price Analysis..... 65

4.11 Number of Questionnaires Per Size Category From Interviews with Market Participants of Encumbered Properties..... 67

4.12 Opinions Regarding Impact of the HVETL on Market Value of Property..... 67

4.13 Opinions Regarding Whether the HVETL Affects Value of a Property and Reasons for the Impact..... 68

4.14 Opinions Regarding Impact of HVETL on Aesthetic Value..... 70

4.15 Opinions Regarding Personal Danger Caused by the HVETL..... 70

4.16 Opinions Regarding Impact of HVETL on Field Operations..... 71

4.17 Opinions Regarding Frequency of Market Involvement..... 71

4.18 Random Sample Results Regarding Opinions of Those Who Do Have an HVETL on the Quarter (parcel #5)..... 79

4.19 Comparison of Opinions From Sales Participants vs. Random Sample and From High River vs. Airdrie..... 81

TABLE PAGE

4.20 Comparison of Sales Participants' Opinion of Effect on Value with Comparable Sales Prices..... 82

5.1 Opinions Regarding Amount of Annual Compensation to be Paid for an HVETL..... 87

5.2 Opinions Regarding the Amount Landowners Would Pay to Relocate the HVETL..... 87

5.3 Landowners Who Would Contribute Financially to Relocate the HVETL..... 88

5.4 Amount of Landowner Contribution to Relocate the HVETL..... 88

6.1 Irrigable, Assessed for Irrigation and Suitable Land for Irrigation in Southern Alberta..... 95

LIST OF FIGURES

FIGURE		PAGE
2.1	Coasian Market Solution, Assuming Zero Transaction Costs and Zero Income Effects	10
2.2	Importance of Elasticity of Market Supply When the Demand Schedule Shifts	19
2.3	Procedure for HVETL Installation	23
3.1	Parcel Numbering for the Random Sample	45
4.1	Impact of HVETL on Opinion of Property Value	73
4.2	Opinions Regarding Impact of HVETL on Potential Building Sites	75
4.3	Impact of HVETL on Opinion of Aesthetic Value	76
4.4	Opinions Regarding Personal Danger Caused by the HVETL	78
4.5	Opinions Regarding Impact of HVETL on Field Operations	79

LIST OF MAPS

MAP		PAGE
1.1	Study Area, Alberta.....	7
3.1	Location of Selected HVETL in South Central Alberta.....	39

I. INTRODUCTION

The purpose of this study is to determine whether or not high voltage electric transmission lines (HVETL) reduce the market value of agricultural property in south central Alberta. Compensation to impacted landowners is also considered. Primary data regarding actual sales of property and landowner opinions are analyzed and policy considerations are presented.

Problem

Requirement of agricultural property for non-agricultural uses such as power lines, pipelines and wellsites has increased since the mid 1970's (Resource Economics Branch, 1982). Landowner concern and discontent have increased regarding these non-agricultural uses. This concern is illustrated by the emergence, mainly between the years 1978 to 1982, of 38 Surface Rights Associations throughout Alberta (Entrup, 1982). These associations are primarily concerned with land use conflicts and with levels of compensation. Another indication of concern was the establishment of The Select Committee on Surface Rights by the Alberta Legislative Assembly. This committee was established on May 23, 1980 to examine the entire subject of surface rights in Alberta and to make recommendations to improve legislation and procedures (Legislative Assembly of Alberta, 1981).

The role of economists in dealing with this issue may vary depending upon the school of thought, orthodox or pragmatic, that is believed appropriate (Sargent, 1960). Economic solutions to property rights problems, land use conflicts and compensation level determination, draw upon legal, political, social and economic tradition and thought. To address only legal precedent and tradition, only political issues, only social concern or only economic concern will most likely not result in a comprehensive solution to landowner discontent. All four discipline areas should be examined in order to determine their interdependence and role in addressing the concern. To illustrate, securing economic efficiency to resolve the concern while not considering legal, political or social concerns or

implications, will most likely be of limited usefulness. This observation is not to suggest that economic efficiency and equity are not important criteria by which to set and monitor performance, but rather that these criteria in isolation may not assist in resolving the conflict satisfactorily. Alternatively, one thesis cannot address each discipline fully nor can this problem of conflict be completely resolved.

This thesis describes and analyzes some economic and legal concerns and the institutional environment surrounding HVETL installations in private agricultural land. Although HVETL's exhibit the indivisibility and nonexclusion characteristics of public goods, this thesis does not expand on these attributes. Rather, opinions of affected or potentially affected landowners are collected and analyzed in order to address social concerns. These opinions are also collected to address the criteria of economic efficiency and equity. Economic efficiency considers the relationship between benefits and costs of a project. All benefits and costs should be included when considering economic efficiency. As such, the impact of an HVETL on both property values of land with towers and land close to towers is considered. If the value of property both with towers and close to towers is reduced, then project costs should consider these impacts on both properties. Also, tangible and intangible benefits and costs should be considered in natural resource decisions (DePape and Phillips, 1976). For example, if an HVETL pollutes an aesthetically pleasing view, this intangible cost should be considered. The second basic objective of equity considers those who gain and those who lose from a project. In the case of more power lines, power users may gain because of a more dependable power system or a system which can deliver more power. The losers may include landowners whose property the lines traverse or whose property the lines come near. One criterion of equity used herein suggests that compensation to the potential losers should ensure that they are not worse off after line construction than before line construction. Before landowner discontent subsides, levels of compensation may be necessary to offset both tangible and intangible landowner losses (costs).

One component of compensation to landowners is in the form of payment for the possible reduction in value of the remaining property caused by the taking. Injurious affection may be considered as a reduction in market value to the remaining property which is caused by a taking or partial taking. This component of compensation has received increased emphasis in Alberta in the late 1970's and early 1980's. Concern regarding injurious affection is especially prevalent when above ground structures such as power poles or structures to transmit electricity are considered. Some Alberta farmers are of the opinion that power lines, especially high voltage electrical transmission power lines (HVETL), reduce their agricultural property values.

The purpose of this study is to investigate any potential negative impact which HVETL may have on agricultural property values. This potential impact is significant for the following reasons:

1. property rights are fundamental rights which landowners feel are being diminished;
2. agricultural property constitutes a major portion of farmers' assets;
3. equitable levels of compensation are a basic objective; and
4. fair compensation is necessary for a good relationship to exist between the power companies and the landowners.

Problem Background

Discontent and potential confrontation exist between energy and agricultural interests because of surface rights issues. The desired situation calls for co-operation between the two groups. The gap between existing and desired situations revolve around four issues: property rights, land use conflicts, compensation and methods of acquisition. These issues may be at the root of any discontentment.

How property rights are distributed, recognized and protected among various entities may well be the main root of the problem.[1] Many

[1] This theme will be developed further in Chapter II.

landowners believe they can control the use of their property. Due to the current institutional process by which an energy company gains rights in property, a landowner does not have the right to stop energy related activities on his property. Some landowners, given the loss of rights to energy uses, question the fact that compensation to them is not based upon a share of the energy companies revenue (Sibbald, 1979). Among the distribution of rights, mineral rights and surface rights are usually held by different entities. Therefore, during mineral recovery, the least cost mineral recovery method may not be the most desirable from the point of view of the owner of the surface rights. If both mineral and surface rights are held by the same entity, conflict is internalized and diminished (Corty, 1981). The distribution and recognition of property rights is fundamentally important to the problem of discontent.

The second issue, energy related land use conflicts, may be developing over time because of changes in technology or because of the increased frequency of energy related uses. As energy related uses of agricultural land increase, the number of impacted landowners and hence the impact of these alternative land uses increases. The increasing price of agricultural land may be another possible reason for landowner concern. This price rise may contribute to most farmers' desires to utilize their land more efficiently and hence intensify their concern regarding above surface structures. Technological change in the agricultural industry in Alberta has been most evident. Size of farm machinery is increasing. The use of irrigation systems appears to be increasing. As these changes occur, impacts of above surface structures may also change. Technological change in energy industries may be causing different impacts. For example, both the size of power lines and wellsite densities are increasing. Therefore, changes in both agricultural and energy related technology may have impacts on land use that intensify conflicts and increase levels of compensation.

Compensation to landowners is a potential root of the discontent. Two aspects of this issue are as follows: methods of determining compensation; and levels of compensation paid to landowners. The

first aspect is quite fundamental and may dictate whether or not a category of compensation for forceable taking should be paid and, if so, the amount of payment.[2] The second aspect, levels of compensation, involves the application of existing compensation principles and legislation to individual situations.

The fourth potential root of the problem, acquisition methods utilized by energy companies, exists because poorly or misinformed agents of companies may cause landowner discontent. Previous unfavourable landowner experiences with construction crews as well as agents may also contribute to discontent. Companies are now attempting to alleviate this problem and obtain increased credibility from the agricultural community. The feeling by some landowners that they are at the mercy of energy companies is partially related to this acquisition problem. This feeling arises out of the institutional processes and property rights issues.

A combination of the roots of the problem, as well as other factors discussed below, may be contributing to the current state of discontent. Three categories of problems (Northrop, 1969) are as follows:

1. problems of logical consistency (for example, if compensation levels are too low, landowner discontent may increase);
2. problems of empirical truth (if landowners believe that a reduction in value of an agricultural property is caused by an HVETL, empirical data should prove or disprove the belief); and
3. problems of value (landowners may feel they have a right to share in an energy company's revenue).

This paper does not attempt to address all problems between the two entities. Rather, it focuses on one aspect which is of current interest and which can be statistically tested. The possible impact

[2] For example, The Select Committee has recommended a $1,000.00 per acre payment for forced taking.

of HVETL on agricultural land values is considered because power lines may devalue property. If adequate compensation is not paid, landowner discontent may increase.

Hypotheses related to the problem should be deduced from economic theory and tested using empirical data. Research regarding the possibility of injurious affection caused by HVETL is necessary to address landowner discontent. It is not, however, necessarily sufficient to completely eliminate the discontent. Further research which includes the legal, political and social aspects may be necessary to determine a complete solution to the problem of discontent.

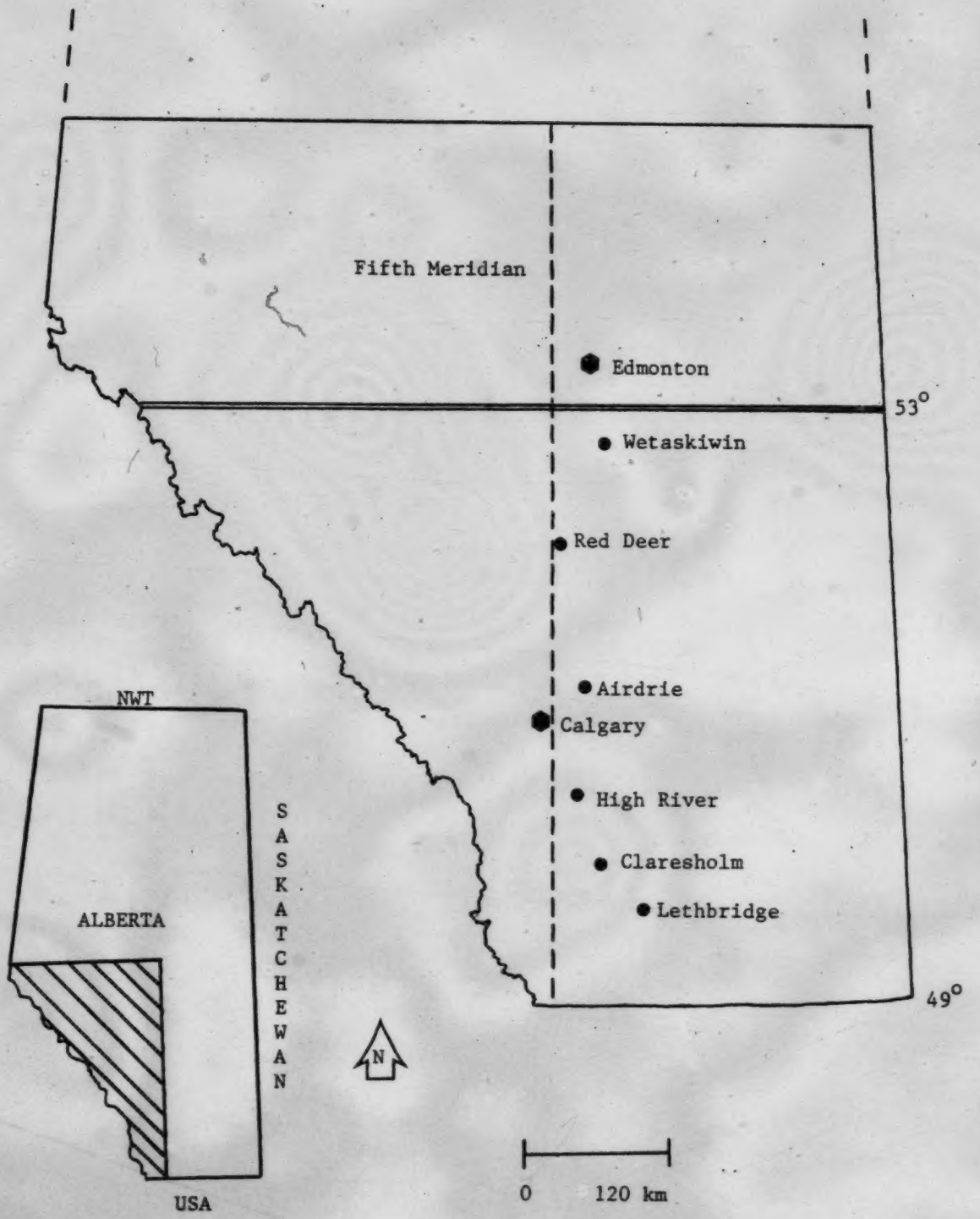
Scope of the Problem

This study attempts to estimate the possible reduction in agricultural property value caused by a recently constructed HVETL between Calgary and Lethbridge. Most parcels which the power line traverses are 160 acres in size and are utilized for agricultural purposes. This study only addresses the concern of a possible reduction in agricultural land values caused by an HVETL.

Possible reductions in agricultural property values caused by an HVETL depend upon numerous variables. The size and placement of the lines are potentially important. For example, an HVETL which is parallel and adjacent to a property boundary may have different impacts than an HVETL which traverses a property diagonally. The type of agricultural land use may be important. The impact on pasture land may be quite different from the impact on dryland cultivation, and these two impacts may be different from the impact on irrigated properties. Size of farm machinery and intensity of land use may be important variables. An HVETL may have different impacts on the use of large as compared to small farm machinery. An impact on property values when buildings are close to the line may be different than an impact on bare land only. Recognition of these variables, and others, is necessary when addressing the problem.

Map 1.1

Study Area, Alberta



Purpose and Objectives of the Study

The primary purpose of this study is to determine if HVETL's reduce the value of agricultural property.

In order to meet this purpose, the following objectives are set out:

1. to identify variables such as power line placement and land use that may influence the relationship between HVETL's and agricultural property values;
2. to determine the validity of perceived reductions in agricultural property values due to HVETL's;
3. to estimate the magnitude of these losses if determined to be valid; and
4. to consider alternative methods of acquiring and compensating landowners for HVETL installations.

In order to meet these objectives, the study is organized in the following manner. Chapter II reviews economic theory and the institutional process which permits construction and use of an HVETL. Chapter III presents statistical techniques and data collection procedures. Chapter IV consists of data analysis and results. Chapter V presents policy considerations, and Chapter VI consists of a summary and conclusions.

II. THEORY AND PROCESS

As discussed in Chapter I, legal, political, social and economic thought are interwoven and may all be brought to bear on the problem of landowner discontent. The purpose of this Chapter is to review some aspects of these areas of thought in order to address the problem. The discussion includes comments on external diseconomies, the notion of property, factors which influence agricultural property values and injurious affection (the impact of an HVETL on agricultural property value). The Chapter concludes with a review of the institutional process by which a power company gains the right to construct and operate an HVETL, and the method by which compensation to landowners is determined. Emphasis is placed on factors which address the possible reduction in value of agricultural property caused by an HVETL.

Land may be thought of as both a factor of production and as a consumption good. Land is an input in the production process which has a derived demand based on its rent earning capacity. This rent, when capitalized, generates value of the land. The highest and best use of land is that use which is most likely to produce the greatest net return in money or amenities over a given period of time (Appraisal Institute, 1980). An externality, such as an HVETL, may affect the highest and best use of land. If so, the value may be affected. Land may also be thought of as a consumptive good. Land purchased for recreational purposes or as a residence may derive a portion of its value from aesthetic qualities. If an externality impacts these aesthetic qualities, value of the land may be impacted. In practice, the value of many agricultural properties is derived from a combination of production and consumption factors. Investigation of both types of demand is important when analyzing an externality.

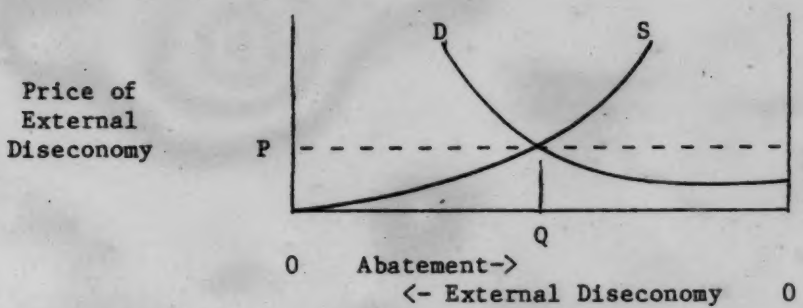
External Diseconomies

The relationship between levels of compensation and levels of an external diseconomy (impact on rights) has been discussed by Coase (1960). An external diseconomy exists when the affected parties are

made worse-off by an activity, and the affected parties have a desire to induce the acting party to reduce the level of that activity. Assumptions initially made by Coase include a simple Pareto - relevant external diseconomy involving two parties, one acting and one affected, in a legal environment of nonattenuated property rights,[3] zero transactions costs and no income effects. Given these assumptions, the Coasian Market Solution estimates the level of abatement (see Figure 2.1). Relaxation of the assumptions of zero transactions costs and non-zero income effects yields different levels of abatement.

Figure 2.1

Coasian Market Solution, Assuming Zero Transaction Costs and Zero Income Effects



Source: Randall, 1981, p. 164.

The external diseconomy used in the Coasian example has various gradients of diseconomy or impact. Air pollution, as an example of an external diseconomy, may vary. Consideration of an HVETL as an external diseconomy is, however, somewhat different. Once the HVETL is constructed, the affected party, the landowner, may desire the acting party, the power company, to reduce the level of diseconomy. The result will be that the HVETL stays or does not stay. Therefore, abatement is either zero or full removal of the structures. Hence,

[3] A set of nonattenuated property rights is completely specified, exclusive, transferable and enforceable (Randal, 1981, p. 148).

once constructed on a particular property, there are no gradients of the diseconomy.

A more fundamental concern is whether the assumption of nonattenuated property rights is valid for the case at hand. The condition of transferability ensures that rights may gravitate to their highest-value use. The Coasian solution assumes the transfer of the right for abatement takes place at the market determined price. The institutional process[4] to install and operate an HVETL and compensate landowners appears to restrict the condition of transferability of rights. If a landowner does not want the external diseconomy (the impacts of the HVETL), he may appear before the Energy Resources Conservation Board at a hearing, but has no guarantee that his property will not be encumbered by the HVETL. If the HVETL is constructed on his land and he disputes the level of compensation, he has no recourse (as long as the Surface Rights Act in Alberta, Section 23(2) a to e, is followed). The landowner has lost a right and no free market gravitation of rights has occurred. Therefore, when expropriation of property occurs, the condition of transferability appears to be violated. Because of this violation, the models as developed by Coase are not applied to the problem of compensation for forced takings when considering compensation for individual parcels.

Property

The effect of an HVETL on agricultural property value may be explained by considering property rights. A reduction in the surface owners' rights is the main reason an HVETL may reduce the value of a property. Rights within the right-of-way are impacted and rights adjacent to the right-of-way may be impacted. Given that property value is dependent upon property rights, a reduction of rights may cause a reduction of value. Impact of an HVETL on rights may vary among properties depending upon the use of each of the properties. Also, various rights on the same property may be impacted

[4] See the last section of this Chapter.

differently. A knowledge of property and property rights is therefore necessary to address the problem of landowner discontent.

The notion of property is difficult to grasp because of various meanings to various disciplines. As Commons (1934, p. 75) discusses, "... the term Property has a double meaning, the economic meaning of scarcity known by economists as an 'economic quantity' and by lawyers as the 'res' or 'property-object'; and the legal or ethical meaning of property-rights, which is the lawyer's meaning of 'property'". The latter meaning, however, is defined as "the working rules enforced by the community upon individuals in their transactions respecting that which is, or is expected to be, scarce". Hence, property may be interpreted by economists as a scarce resource or commodity, and by lawyers as rights. These two concepts are interrelated as illustrated by J. L. Knetsch (1980, p. 20), who stated that "the notion of property can be taken to refer to a wide range of entitlements to the use or benefit of various assets which enjoy some sort of support or protection".

The rights which society distributes, recognizes and protects for use of property are not only important to this study but are also fundamentally important as presented by L. W. Libby (1974, p. 1,143).

> "In some sense land use patterns are a physical template of all the pressures inherent in location of people and things in modern society. Debate is focused on land but reflects more basic human motivations and values-stability, privacy, freedom, and income."

Property rights do not only reflect, but are partially derived from human motivations and values and hence, may change as societal values change. This concept has been expanded upon by authors such as Knetsch (1980, p. 20), who states:

> "Property rights are derived from a variety of sources including the customs and traditions of a society, legislation and regulations, and the rulings of courts and other tribunals. They are neither absolute nor static, but

> are subject to change as legislatures, administrative agencies, the courts and other institutions respond to changing demands and values."

The rationale for a pragmatic approach when considering a problem which is rooted in property rights is thus well illustrated.

Property rights can be considered as a primary economic institution not only because of their importance but also because several kinds of economic institutions are derived from them. These derived institutions include credit, taxation and tenancy. An institution has been defined as "collective action in restraint, liberation, and expansion of individual action" (Commons, 1934, p. 73). Institutions have also been defined as "sets of ordered relationships among people which define their rights, exposure to the rights of others, privileges, and responsibilities" (Schmid, 1972, p. 893). As is evident, property can be thought of as a primary economic institution.

Property may also be thought of as a bundle of rights. Property has been called "ownership, the unrestricted and exclusive right to a thing; the right to dispose of a thing in every legal way, to possess it, to use it, and to exclude everyone else from interfering with it" (Black, 1968). Alternatively, these rights include the right to possess, use, sell, devise, lease, mortgage, subdivide, and to grant easements (Barlowe, 1978, p. 398-399). An entity who holds title in fee simple has all of the rights to the property which are available and which are enforced. In Alberta, various statutes remove proprietory rights of an owner. These statutes range from Historical Site Preservation Acts to the Noxious Weed Act to the Expropriation Act of Alberta (Smith and Bauer, 1981). As shown, legislation, which is founded in societal values, may limit the rights of a holder of property. These limitations may change over time. Therefore, the specific rights may change over time. These rights, however, create and modify the value of property.

Agricultural Property Value

Since the purpose of this study is to determine whether or not an HVETL causes a reduction in agricultural property value, the specific factors, including presence of an HVETL, property location and soil quality, which influence value are considered. Agricultural property is defined herein to be property which is used for the production of food and fibre but which is not in close proximity to major urban centers. The exclusion of urban-rural interface property is considered necessary because the value of such property is influenced by an interaction of urban and rural market forces.[5] This interaction complicates attempts to quantify the impact of an HVETL. Because the study is concerned with agricultural value, the exclusion is reasonable.

The agricultural property market does not conform to the perfectly competitive market model with its assumptions of a very large number of sellers, a homogeneous product, a large number of buyers and perfect knowledge regarding prices. The agricultural property market is characterized by a number of factors which include a small proportion of total farms being traded each year, uniqueness of each parcel of property, infrequent participant involvement in the market, highly localized bidders and large financial considerations which are usually involved in property transactions (Roehle, 1971). Differences between the assumptions of perfect competition and the characteristics of the agricultural property market are recognized in the definition of market value. Market value is defined as "the highest price in terms of money which a property will bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller, each acting prudently, knowledgeably and assuming the price is not affected by undue stimulus" (Appraisal Institute of Canada, 1980). The underlying principle suggests that value in exchange is determined by the interplay of supply and demand.

[5] See Chicoine (1981) for a discussion of the effect of urban influence on farmland values.

Supply of Agricultural Property

The supply of land can be thought of to include the physical supply or existence of land and the economic supply or that portion of the physical supply that man uses (Barlowe, 1978, p. 22). The economic supply of land thus changes with technological advancement and changing demands for property. In other words, economic supply of land varies with the highest and best use of property. A third concept of market supply is considered to be a schedule of quantities of agricultural property which will be offered for sale at various price levels at any given time. The market supply of property is influenced by such factors as retirement of farmers, inability of landowners to meet financial obligations, and more attractive employment and investment opportunities.

Demand for Agricultural Property

Demand may be associated with desires, needs or requirements for commodities or services. Effective demand is the willingness and ability of people to buy (Barlowe, 1978, p. 22). Demand for agricultural property is composed of two components: demand for property as a productive good and demand for property as a consumptive good (Roehle, 1971). Demand for property as a productive good results from the productive potential of the land. This demand for a property is a derived demand and is a function of a properties income producing potential. Demand for property as a consumptive good may arise when land itself is used for consumption. Examples include land which is used for recreation purposes or residential sites. An agricultural property with a mountain view or other aesthetic attributes may increase the market value of a property although these attributes may have no direct relationship with income producing potential (Roehle, 1971, p. 15). Demand for agricultural property is a combination of both productive and consumptive demand.

Many specific factors interact to create the demand for agricultural property: factors influencing property values over time and factors influencing the value of one parcel of property versus another at one specific point in time. Analysis of factors which influence property

values over time is known as time series analysis. Some time series factors which have been identified include: expectations of returns to farmland (both net farm income and gross farm income), technological advance and farm enlargement, inflation and expected capital gains, population factors and concessional credit and its availability (Roehle, 1971; Dey, 1982).

Cross sectional factors determine the value of one property which differs from that of another property at one point in time. Cross sectional factors are important to this study because the purpose is to determine whether or not an HVETL has a negative impact on agricultural property values. Some cross sectional variables are identified and briefly described. Proximity of a property to an urban center of product markets and input outlets typically has a positive impact on property values. Access to a paved highway or good gravel road usually increases values. In most agricultural areas, good soil, level topography and a high percent of a parcel being cultivated increases values. Parcel size may affect value. Typically, smaller parcels sell for a higher value per acre. Building value must be considered as buildings may contribute to the total parcel value. Properties with irrigation rights may sell for a higher value than comparable property without such rights. Mineral rights are not typically included with the sale of a property but if included, may add to value. Favourable terms of sale, such as beneficial financing, may increase value. Aesthetic attributes may also influence value. Severance of a property by a railroad or road may reduce the value of agricultural property. Wellsites and pipelines may also influence property value. Transactions which occur within families are typically below market value and are considered to be non-"arm's-length" transactions. Analysis of sales which are non-"arm's-length" may provide results which are suspect. The interaction of all of the above mentioned factors may influence demand for a specific property. The number of factors and numerous possible combinations illustrate the potential uniqueness of each property. This uniqueness of properties is an important characteristic of the agricultural property market.

Elasticities of Supply and Demand

Potential impact of an HVETL is typically thought to affect value per acre. However, depending upon the elasticities of supply and demand, the quantity of property which is traded per unit of time may also be impacted. This concept is discussed in more detail. Elasticity of supply is a measure of the responsiveness of quantity supplied to a change in price whereas elasticity of demand is a measure of the responsiveness of quantity of a commodity demanded to a change in market price (Lipsey, Sparks & Steiner, 1976). Potential impact of an HVETL on agricultural property value varies depending upon the elasticities of market supply and market demand for agricultural property. Installation of an HVETL may affect both the productive and consumptive components of demand. For example, demand for property as a productive good may be shifted if expected earning capability of the property is reduced. If an HVETL reduces aesthetic appeal of a property, consumptive demand may also be shifted. Therefore, an HVETL may induce a shift of the demand curve to the left. If the supply schedule (i.e. market supply) of agricultural property is not affected by the HVETL, the magnitude of the price change will partly be determined by the elasticity of supply. Therefore, the effect of a change in a land characteristic may not all be captured by the price change (Sinden and Worrell, 1979, p. 291). Consider Figure 2.2 (a) in which the market supply of property is slightly elastic. The HVETL may impact both the price and quantity exchanged. The price difference caused by a shift from D_1 to D_2 is P_1 to P_2. However, at total quantity Q_2, buyers would have been willing to pay P_4 if the property had no HVETL, giving a difference in willingness to pay of $P_4 - P_2$. The difference in willingness to pay at total quantity Q_1 is $P_1 - P_3$. Therefore, the difference in price ($P_1 - P_2$) tends to underestimate the loss caused by the HVETL. However, if the supply of property is completely inelastic, the entire effect will be captured in the property price change.[6] Considering Figure 2.2 (b), the entire effect of a shift from D_1 to D_2 is captured in the price change from

[6] Sinden & Worrell's (1979) example considers insect defoliation causing trees on residential land to be destroyed.

P_1 to P_2. The elasticity of market supply of agricultural property is an empirical question. The purpose of this discussion is not to estimate this elasticity but rather to show the importance of recognizing that elasticity of market supply may influence whether impact of an HVETL is observed only in price or is split between quantity demanded and price. Traditionally, compensation to impacted landowners has been paid only if a reduction in property value (price) has been proven.

Injurious Affection

Injurious Affection may be considered as a reduction in market value of the remaining property caused by the taking. The taking, in this study, is to construct and operate an HVETL. Compensation for Injurious Affection is created by statute and molded by case law. Therefore, differences between provinces and countries and differences over time may exist. However, some general principles are common to all areas of Canada. Three different situations in which injurious affection may arise have been described by Todd (1976, p. 266-268). These situations include: injurious affection by severance (where part of an owner's land is expropriated and the remaining piece or pieces are rendered less valuable as a result of their severance), pure injurious affection (where part of an owner's land is expropriated and the remaining piece or pieces are rendered less valuable as a result of the actual or intended use made of the portion expropriated), injurious affection - no taking (this situation only applies in certain cases). Three criteria which must be satisfied when compensation for injurious affection is sought are also outlined (Todd, 1976, p. 269). These criteria are: "(a) the land injuriously affected must have been 'held with' the expropriated land; (b) the land injuriously affected must have been depreciated in value by activities upon the expropriated land; and (c) the damage suffered must not be too remote". Each criteria is discussed in Todd's text. Criteria (c) concerns the remoteness of damages suffered and is somewhat subjective. In a decision of the Alberta Supreme Court, that court felt that the Public Utility Board "erred in determining damages for injurious affection by considering only the severance damage

Figure 2.2

Importance of Elasticity of Market Supply

When the Demand Schedule Shifts

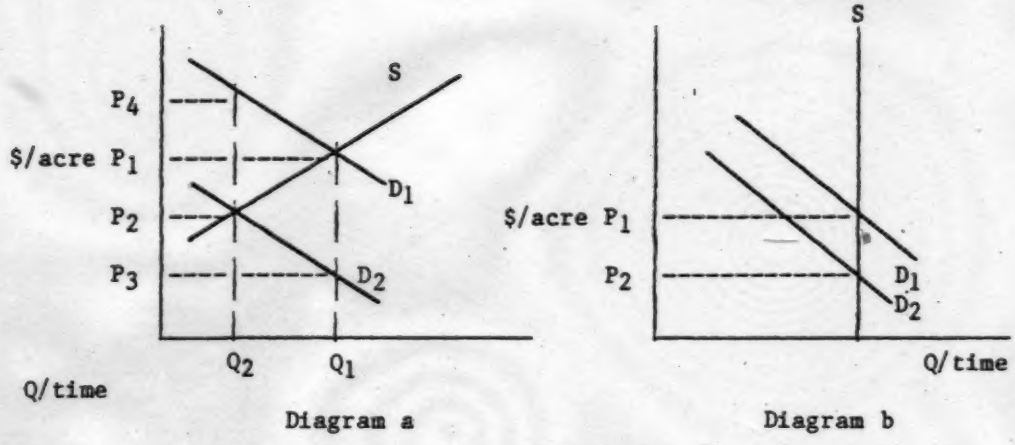


Figure 2.2 shows the influence of elasticity of market supply on the change in price with a shift in demand. Diagram 'a' has a slightly elastic supply. Figure 'b' illustrates a perfectly inelastic supply.

caused by the power line to the remaining land on the basis of its continued use as farmland, and failing to take into account the possible zoning of such land for residential or small site purposes in the future and the fact that the towers and cables of the power line would make the land less valuable and attractive for such purposes." (Dominion Law Reports, 1963, p. 265). The above cited case suggests that a change in land use, when such a change is possible, should be considered and hence is not too remote. However, each particular case may have unique characteristics which should be considered.

An important issue is whether injurious affection is to be paid if there is a decrease in value to the remaining property (including remaining landowner rights in the right-of-way) as compared to a decrease in value to the balance of the land outside of the right-of-way. This distinction does not arise if an expropriation is in fee simple. However, either a statutory easement or a right of entry order divides interests in property between the power company and the landowner. Therefore, the landowner retains some rights to property in the right-of-way in addition to the rights held outside the right-of-way. A problem arises in attempting to value the remaining rights which a landowner holds in a right-of-way. As outlined by Todd (1982, p. 14-19), the owner is entitled to compensation for the portion of his land which is taken plus compensation for any decrease in the value of the portion remaining.

Compensation in Alberta for the rights acquired by a company for an HVETL have included 100% of the en bloc per acre value applied to the area in the right-of-way. However, the landowner retains some rights such as the right to farm the right-of-way. The question becomes whether the value of the remaining rights should be considered to have value to the owner or should be considered to have no value to the owner. This question is currently being debated not only with regard to power lines but also with regard to pipelines and wellsites.

In summary, injurious affection may occur if current or potential use of the balance of the property is affected by the HVETL.

The Institutional Process

Since this study considers the impact on value of agricultural property caused by the taking of some rights for construction and operation of an HVETL, an examination of the institutional process involved in compensation is essential. Key Alberta government agencies involved in the institutional process of rights obtainment and compensation are the Energy Resources Conservation Board (ERCB) and the Surface Rights Board (SRB). The ERCB has the responsibility of 1) ensuring the need for the proposed HVETL and 2) selecting the most desirable route (Figure 2.3). When the ERCB is satisfied with the need for an HVETL and has selected a route, the Board issues a Permit to construct. This permit outlines the route of the HVETL. The power company then attempts to negotiate an easement with affected landowners. This easement typically outlines compensation to be paid to the landowners. If negotiations are unsuccessful, the company can apply to the Surface Rights Board to issue a Right of Entry order. This order typically includes a Plan of Survey showing the exact location of the Right of Way. Landowner confusion exists over which Board decides the final route (Sibbald, 1979, p. 31). The SRB, under Section 19 of the Surface Rights Act can alter the route to a minor degree. The Select Committee on Surface Rights (Legislative Assembly of Alberta, 1981, p. 12) has recommended that the SRB act solely in the area of compensation. The implication suggests that the ERCB should issue Right of Entry orders. Once a Right of Entry order is issued, the power line may be installed.

The rights taken can either be in the form of an easement or a Right of Entry order. An easement "is a right enjoyed by one landowner over the land of another and is obtained for a special purpose rather than for the general use and occupation of land" (Smyth and Soberman, 1976, p. 518). One essential requirement of an easement is that there must be a dominant tenement (a piece of land to benefit from the easement) and a servient tenement (the land subject to the easement). In the case of a power line, the power company is not considered to be a dominant tenement because it owns no land reasonably close to the servient tenement (Smyth and Soberman, 1976, p. 518-519). Therefore,

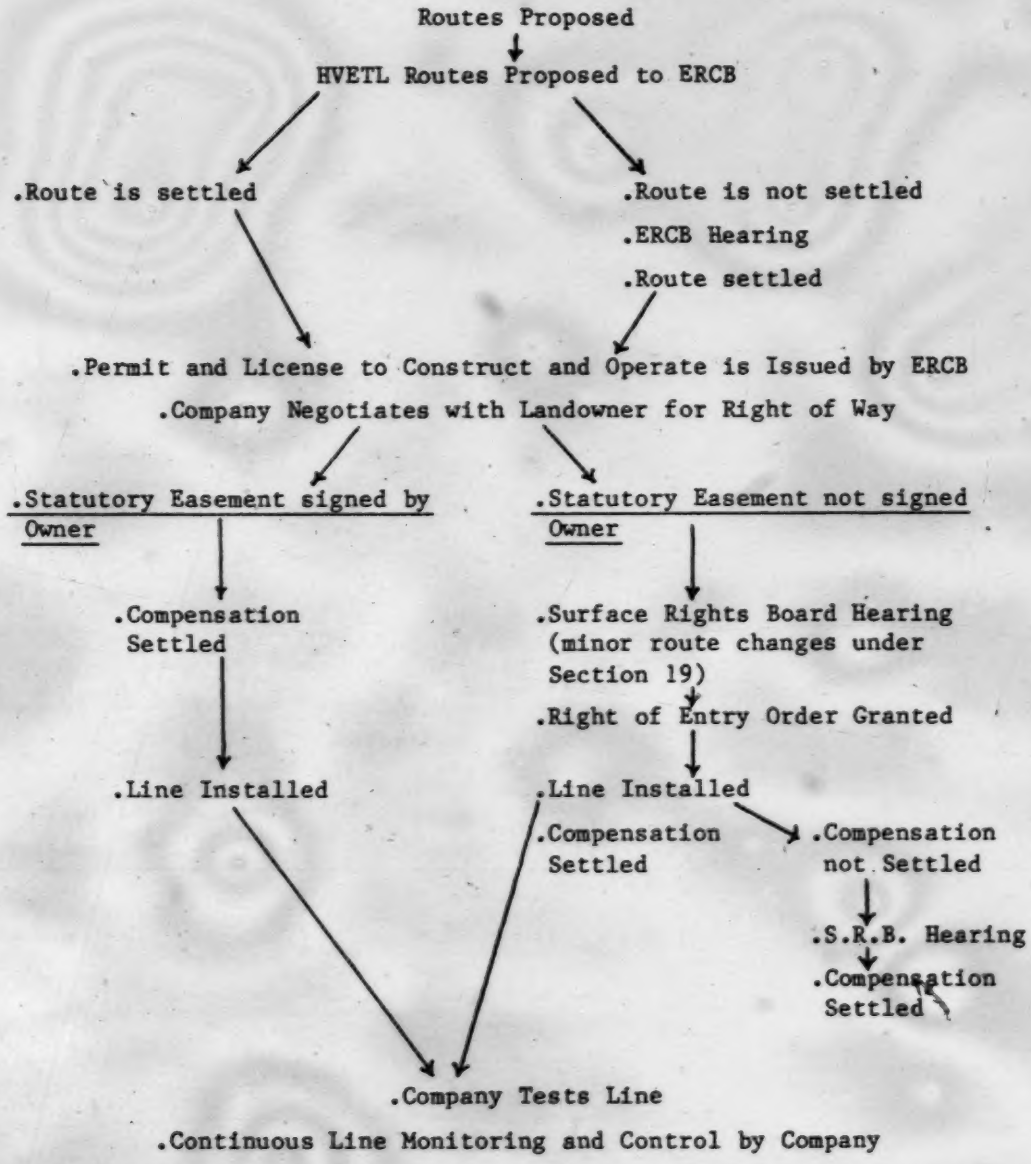
strictly speaking, the ability of the power company to gain rights to construct and operate an HVETL is not an easement but rather is created by statute. A statutory easement consists of rights created by statute in favour of local authorities which share some but not all of the characteristics of common law easements (Jackson, 1978). A statutory easement is compared to a Right of Entry order which is issued by the Surface Rights Board and provides the power company with the rights to construct and operate the HVETL. The basic difference between a statutory easement and a Right of Entry order is the easement is a negotiated agreement between the company and the landowner while a Right of Entry order typically implies non-agreement between the two parties (Figure 2.3).

Compensation to the landowner, if a Right of Entry order has been issued, is generally determined after line construction. The SRB has the responsibility for determining compensation payable to the landowner. Section 23(2) a to e of the Surface Rights Act outlines the heads under which compensation may be considered. The purpose of this paper is not to investigate, in detail, each head of compensation; however, a brief discussion of the current interpretation of this Section, as relating to power lines, follows:

a) value of land -- this category of compensation is generally interpreted to be 100% of the parcel value from which the right-of-way is acquired, on a per acre basis, multiplied by the number of acres in the right of way;
b) loss of use -- considered are crop loss during construction and expected crop loss in the future which is caused by the HVETL;
c) adverse effect -- the extra time to farm around the HVETL structures plus nuisance and inconvenience, is typically considered under the heading;
d) damage — typically included items are rocks, permanent compaction, or removal of top soil which may have been disturbed during construction; and
e) other -- case specific items of compensation can be included under this category.

Figure 2.3

Procedure for HVETL Installation


Routes Proposed
HVETL Routes Proposed to ERCB
.Route is settled
.Route is not settled
.ERCB Hearing
.Route settled
.Permit and License to Construct and Operate is Issued by ERCB
.Company Negotiates with Landowner for Right of Way
.Statutory Easement signed by Owner
.Statutory Easement not signed Owner
.Compensation Settled
.Surface Rights Board Hearing (minor route changes under Section 19)
.Right of Entry Order Granted
.Line Installed
.Line Installed
.Compensation Settled
.Compensation not Settled
.S.R.B. Hearing
.Compensation Settled
.Company Tests Line
.Continuous Line Monitoring and Control by Company

Compensation in Alberta for HVETL was, prior to 1979, generally paid on a one-time, lump sum basis. Some components of compensation for power lines constructed after that date may be paid on an annual basis. These components are loss of use and adverse effect. The amount of annual compensation may be reconsidered every five years (The Surface Rights Act). A recommendation of the Select Committee is that legislation provide the right to landowners to seek annual compensation for all major transmission line surface structures regardless of their erection date (Legislative Assembly of Alberta, 1981, p. 28). As illustrated by this recommendation, ongoing problems and hence annual compensation must be of concern to landowners. Landowner concern regarding compensation for power lines has previously been noted as illustrated by the general finding that amounts of compensation are considered adequate for pipelines and wellsites and too low for power lines (Sibbald, 1979, p. 28). Therefore, concern may hinge on the application of the legislation when considering HVETL.

Summary

Aspects of economic and legal theory which combine to create and modify property and property value have been discussed. The institutional framework which outlines the process of rights obtainment and compensation for those rights is especially important. This is because compensation for injurious affection is created by statute. In other words, if the surface rights legislation did not allow for the consideration of injurious affection, no compensation to potentially impacted landowners would be paid. The current legislation is such that the landowner can be awarded injurious affection compensation if the claim is substantiated. In other words, the burden appears to rest with the landowner to illustrate injurious affection. The opposite of this situation would be for injurious affection compensation to be paid unless the company illustrates that no injurious affection has resulted from the taking.

The questions of when the value of agricultural property may be reduced and which statistical techniques can be utilized to measure any value reduction are addressed in Chapter III.

III. STATISTICAL TECHNIQUES AND DATA COLLECTION

This chapter considers under what conditions the value of agricultural property may be reduced. Statistical techniques which can measure value reduction are then discussed. The chapter concludes with a discussion of the data collection techniques and presentation of data.

Impact on Demand

The market value of a property is reduced if the demand curve is shifted to the left. However, because of the uniqueness of each property, the infrequent involvement of participants in the real estate market and differences in personal tastes and preferences, not all market participants may view the external diseconomy equally. If a portion of market participants do discount the property and a portion do not discount it, the value need not necessarily be reduced. This non-effect is due to the fact that the nondiscounting participants may bid against each other and buy the property at a nonaffected price. Therefore, although many participants may consider the external diseconomy as a detriment, the market value is affected only when a high proportion of participants discount the property.

Market participants may discount the property because of the HVETL for various reasons. The potential impact on demand will be discussed by considering separately demand for property as a productive good and demand for property as a consumptive good.

Demand for Property as a Productive Good

Present Use: Economic theory suggests that the present value of a property is a function of the properties income producing potential ($V=^{a}$ where 'V' is value, 'a' is annual returns and 'i' is an appropriate discount rate). A reduction in the properties income producing potential causes a reduction in the present value of the property. Most research which considers economic impacts of HVETL on agricultural property calculates the impacts based on annual returns. The purpose of this study is not to analyze the impacts on annual returns in detail. Rather, a survey of research on the topic is

presented. Several studies consider impacts in provinces and states other than Alberta. Some of the studies are briefly discussed. Bomford (1974) found the best location for a tower in terms of wasted time, lost area and minimum equipment contact is straddling a fence line. He also found the major financial effect of a tower to be the loss of crop on the area occupied by the tower. Weed control is also discussed in the report. The Doane (1977) report considers both the impacts of a power line on cultural practices associated with crop production and potential impacts on market value of farms. Included in the first portion of the study are time studies to assist in analyzing the extra time required to farm around various structures. Other aspects of the field study included power line impacts on aerial spraying, damaging of machinery on the structures, weed problems, soil compaction and its effect on yields, frequency of reentry, and in areas where irrigation is practiced, the effect upon irrigation practices. Regarding irrigation, the report states that utilities need to give more thought and care in planning new routes through any area where irrigation is a possibility. The report suggests that lines should be constructed on a half-mile line so as to reduce impact on irrigation systems. Pacquett (1979) discusses power line aesthetics, negative effects on normal farm operations, negative effects on aerial operations and irrigation under power lines. Regarding power line aesthetics, the report states "the presence of a power line through rural areas, until recently, had always been considered a sign of progress, the advent of modern living and all its advantages. Nowadays, however, electrical lines crossing fields and forests are all too often condemned as eyesores, insults to the beauty of our countryside" (Paquette, 1979, p. 11). This statement is important because potential impacts of an HVETL on property values may well change as the values of our society change. Fortin (1980) analyzes time and land lost with electric towers. Three methods of evaluating time and land loss are included. These methods are a) simulation in the field, b) simulation in the laboratory and c) graphic projections and computer programs. Scott (1981) considers the effects of transmission towers on annual tobacco production costs. A recommendation of this study is "a procedure should be developed to

ensure that findings from current research into transmission line impacts are incorporated into the route selection/tower location process" (Scott, 1981, p. 18). This recommendation certainly applies in Alberta. The Board which has the responsibility of route selection should most certainly have a procedure to evaluate and incorporate research results. Studies completed in Alberta (McKinnon, et al, 1978; Sibbald, 1977; Resource Economics Branch, 1979) are of particular relevance. Based upon the Resource Economics Branch study, annual impact, including value of production loss, value of extra time to farm around structures and cost of chemical weed control is $31.50 per structure in 1978 dollars. The McKinnon (1978) study includes the aforementioned variables plus time loss due to collision and insurance for collision repairs and estimates annual cost per structure to be approximately $33.00 (1977 dollars). Utilizing a 12% per annum rate of increase, 1981 costs are approximately $44.00 to $52.00 per structure respectively as outlined in Table 3.1.

Assuming that $50.00 per structure (1981 basis) is the annual reduction in returns and that the average number of structures per quarter section is 2.5, the annual reduction per quarter is $125.00. Capitalizing $125.00 in perpetuity at a real discount rate of 5% results in a present value of $2,500.00. Therefore, a quarter section on which no annual compensation is paid may be expected to have a value of $2,500.00 less than a similar quarter on which annual compensation is paid. These calculations are based on dryland cultivated parcels and reflect impacts of HVETL on present use.

Potential Use: An HVETL may impact the present market value of a property because of potential changes in land use. For example, a potential change from dryland to irrigation farming may increase the value of a property which is currently dryland. The following example illustrates this point. Assume property A is currently irrigated with a sprinkler system, property B is currently utilized for dryland crop production but has potential for irrigation (a change in land use) and property C is currently utilized for dryland crop production and has no foreseeable potential for irrigation use. Although properties B

Table 3.1

Alberta Studies Researching Impact of HVETL on Agricultural Returns

Study	Year	Problems Noted	Additional Annual Cost Per Structure	Additional Cost (1981 dollars)
McKinnon	1978	1, 2, 3, 4	$33.00* (1977 dollars)	$52.00**
Sibbald	1977	1, 2, 4, 5, 6, 7		
Resource Economics Branch	1979	1, 2, 3, 4, 5, 6	$31.50* (1978 dollars)	$44.00**

1 weed control
2 higher risk of machinery damage
3 additional labor and time
4 yield loss from operations overlap
5 aerial operations
6 irrigation
7 farm planning process

* Approximate.
** Calculated utilizing a 12% per annum rate of increase.

C are both currently utilized for dryland production, the market value of property B is higher because real estate market participants anticipate a change from dryland to irrigation farming at some future time. Suppose land values are as follows:

Parcel	Market Value Per Acre
A	$1,000.00
B	$ 700.00
C	$ 400.00

Impacts of an HVETL on properties B and C in their current use are similar. However, the impact on property B, if and when irrigated, may be substantial. Variables to consider include type of irrigation system and placement of the HVETL. As an extreme example, if the property were to have a quarter section pivot irrigation system and because of the placement of the towers, this system were not possible, negative impact may be substantial (amounting to the difference in expected net returns from the quarter section pivot versus from the alternative irrigation system). If current market participants perceive the adoption and/or profitability of irrigation to be negatively impacted by the HVETL, the present value of the property may be reduced.

An HVETL may have impacts on future property value but these impacts are not recognized in the present value of the property. For example, technology in the agricultural industry may change in such a manner as to cause the HVETL to reduce property value. However, because this change is unknown by market participants in the current time period, no impact on present market value is recognized.

Demand for Property as a Consumptive Good

An HVETL may impact the consumptive characteristics of a property. Consumptive characteristics of a property include such items as a mountain view or scenic building site. Market value of a property may be reduced if the consumptive characteristics of a parcel are less appealing. An HVETL located close to buildings represents another

instance of potential reduction in market value of a property. Market participants may discount the value of a property because of unsightliness of the HVETL, television and radio interference or because of uncertainty regarding effects on human beings or livestock. The measurement of this potential impact on consumptive components of property value is difficult to quantify. The importance of considering consumptive components should not, however, be forgotten. Knetsch (1980, p. 21) discusses the relevance of non-market values.

> "Values which do not find ready expression in markets tend to be both more difficult to assess and to be taken less seriously or as being a less worthy claimant to the use of resources. There is apparently a continuation of an institutional preference for economic values that appear in cash flows over those -- albeit of equal economic worth -- that do not." "There seems to be continued sympathy for the view of early English judicial opinion that regarded amenities, for example, as 'mere delights' to be accorded little weight".

The potential impact on consumptive as well as on productive items should be considered. A difficulty is to find analytical techniques which can measure these impacts on property values.

Statistical Techniques

Various statistical techniques have been utilized in previous studies in an attempt to determine if HVETL reduce agricultural property value. A review of methodology and of these various analytical techniques are presented. Other relevant studies are also reviewed. This section consists of four subsections: purpose; collection of data; analytical techniques; and results.

Purpose

The purpose of most related studies considers whether or not the external diseconomy reduces the market value of the property. The external diseconomy in the present study is the potential negative effects of an HVETL. The impacts of a railway, for example, have also been studied (Poon, 1978). Given the purpose is to investigate a

reduction in value, a one-tail test of hypothesis is appropriate. Two related studies state their purpose to investigate whether an HVETL impacts the price of farmland (Realty Research, 1974; Woods Gordon, 1981). A two-tail test of hypothesis is appropriate when testing for an impact (i.e. a reduction or an increase). The objective of the present study is to determine whether an HVETL reduces the value of agricultural property. Therefore, a one-tail test of hypothesis is appropriate.

Collection of Data

All studies which were reviewed analyzed property sales or transactions by testing for a reduction (or difference) in the market value of a property with an HVETL as compared to a property without an HVETL. However, the thoroughness used to check the validity of the property transactions varied considerably. For example, The Royal Commission Study (1978), collected data from records of Regional Registry offices and eliminated low transfer values which were assumed not to be "arm's-length". No verification of the transactions with purchasers or vendors occurred and building value was not deducted from the transaction value. Conversely, Deloitte Haskins & Sells Associates (1981), looked at Land Titles Office transfers and then confirmed sales with purchasers or vendors to ensure they were "arm's-length" and that the data were correct. The significance of checking transfers (at least in Alberta) was shown by Deloitte Haskins & Sells Associates (1978). Data from only 54 of 290 transfers was entirely correct and represented "arm's-length" transactions. Therefore, unconfirmed Land Titles Office transfer information may yield results which are suspect. Verification of sales information is considered necessary in order to produce reliable results.

Previous studies have compared selling prices of properties encumbered with a power line to properties without a power line. Sales of unencumbered properties have been selected utilizing three basic techniques which include: gathering sales within the same region, county, or crop division as the HVETL (Brown, 1975; Deloitte Haskins & Sells Associates, 1981; McKinnon, Allen, 1981); gathering sales within a

specified distance of the externality (Deloitte Haskins & Sells Associates, 1981; Poon, 1978); and gathering sales from a control width which extends parallel to the HVETL (Royal Commission, 1978). Once the unencumbered sales have been collected, they have been classified as either in-sight or out-of-sight of the HVETL (Realty Research, 1974) or classified depending upon their distance from the externality (Poon, 1978; Woods Gordon, 1981). Expectations are that the closer a property to the HVETL, the more impact on the property and hence more potential for a reduction in market value of the property.

The unique characteristics of each parcel of property have been considered to varying degrees in the related studies. Variables recorded include sale price per acre, date of sale, farm type, acreage, farm building value, farm dwelling value, soil quality or classification (for agriculture), amount of land tiled, amount of land cultivated, proximity to HVETL, proximity to other rights of way, number of hydro towers per farm, neighborhood, distance from shipping point, distance to nearest highway, distance to nearest town or city, and whether a railway traverses the property (Deloitte Haskins & Sells Associates, 1981; Woods Gordon, 1981; Brown, 1975; Realty Research, 1974). Not all variables have been utilized in each study but all may well influence agricultural property value. Depending upon the methods of analysis, different numbers of the variables have been considered.

Some of the studies (Doane, 1977; Realty Research, 1974) included a survey of landowner opinions to supplement the market value analysis. Questions regarding the impacts on production and market value were asked. The use of questionnaires to supplement statistical analysis is considered to be a useful addition to a study of this nature. The opinions obtained through use of a question may aid in the

interpretation of the market value results as well as contribute additional information.[7]

Analytical Techniques

The analytical techniques used in related studies include comparison involving two sample means, appraisal techniques, and regression analysis. Comparisons involving two sample means includes comparison of two sample means (Deloitte Haskins & Sells Associates, 1981; McKinnon et al, 1981), and comparison of sample means, meaningfully paired observations (Deloitte Haskins & Sells Associates, 1981). Comparison of two sample means assumes two normal populations and two independent, and hence uncorrelated, random samples (Steel & Torrie, 1980). If this technique is used, the unencumbered sales should be randomly selected. If the unencumbered sales are selected because of their similarity to on-line sales, the assumption of independence will be violated. Because of the uniqueness of each property and variance in market value between sales, the use of the comparison in two sample means technique may be less preferable than the use of comparison of sample means of meaningfully paired observations.

The comparison of sample means of meaningfully paired observations increases the ability of the experiment to detect small differences if members of a pair (sales) are positively correlated, that is, if members of a pair tend to be large and small together (Steel and Torrie, 1980). Researchers investigating the impact of an HVETL on agricultural property values may tend to select off-line sales close to the HVETL in an attempt to control the number of complicating factors. If sales are selected in a relatively long, narrow width, the variance in price along the length may be considerable. Given this scenario, the paired comparison test may provide a superior design to a comparison of sample means test. Assumptions of the paired comparison test are that the differences are normally distributed and that the pairs are a random sample. The pairs are

[7] For example, see Brookshire, et al, 1982 for a comparison of survey and hedonic approaches to valuing public goods.

chosen to be as similar as possible in all factors affecting market value.

Appraisal techniques have recently been utilized in an attempt to consider the unique characteristics of each parcel (Woods Gordon, 1981; Deloitte Haskins & Sells Associates, 1981). This technique makes adjustments for apparent dissimilarities between characteristics of off-line sales to on-line sales. Based on these off-line sales, the expected price of the encumbered property is compared with the actual sales price. This technique may be criticized for use of subjective adjustments. However, the advantage that each parcel is considered and investigated individually may offset any possible disadvantage.

Multiple regression analysis has been utilized as an analytical tool to investigate whether an HVETL reduces agricultural property value (Realty Research, 1974; Woods Gordon, 1981; Brown, 1975). Multiple regression analysis has also been utilized, among other things, to measure railway externalities and residential property prices (Poon, 1978) and the value of quiet from airport noise (McMillan et al, 1980).

Multiple regression analysis considers the casual relationships of several independent variables (Xs) on a dependent variable (Y). In studies of this nature, the following functional relationship is conceptualized.

$$Y = f(X_1, X_2, X_3 \ldots X_n)$$

Where Y, the market value of agricultural property, is some function of X_1, X_2 .. X_n, a number of factors which exhibit a cause and effect relationship with Y. One of the independent variables, X_1, can be distance from the HVETL or a dummy variable indicating whether or not the property is encumbered by an HVETL.

Specification of a functional form is necessary when using regression analysis. The previous studies dealing with HVETL impacts on property values have used linear functional forms (Woods Gordon, 1981; Brown, 1975; Realty Research, 1974). Other functional forms have been tried by various authors. These include log (Poon, 1978) and semi-log (McMillan et al, 1980). A priori one cannot determine which functional form best represents the relationship between the independent and dependent variables.

The studies reviewed attempt to determine if an HVETL reduces agricultural property value. Because of limited data available at any one specific date, sales over a period of time are collected. The problem of whether the sale prices should first be converted to a common date or whether an independent variable for date of sale should be included in the model specification is relevant. Conversion of the sale prices to a common date by considering changes in value over time was undertaken by Brown, (1975) utilizing average value of farm land information over time, by Woods Gordon (1981) utilizing the GNP real price deflator and by Poon (1978) utilizing a house price index. Alternatively, an independent variable for date of sale was included by Realty Research (1974) and by McMillan et al (1980). Results from the two different techniques are not expected to differ substantially.

Results

Most study results report that HVETL do not significantly reduce the market value of agricultural property. However, the definition of agricultural property may influence results obtained. Woods Gordon (1981) report that transmission lines do not appear to affect the value of land in areas strictly devoted to agricultural uses but may lower the selling price of properties in areas where rural estate development is most likely to occur. Doane (1977) found very few cases where there was any perceptible or acknowledged loss in value directly attributable to the power line. However, an exception to this finding is in the case of irrigated property and particularly when the use of center pivot systems are eliminated. In these circumstances, substantial damage may occur. Deloitte Haskins & Sells

Associates (1981) found a reduction in the price of properties traversed by an HVETL. The HVETL investigated runs parallel to the Rocky Mountains is influenced on the north portion by a demand for residential acreages because of proximity to Calgary and influenced to some degree by irrigation potential in various areas along the HVETL. In summary, previous studies indicate that an HVETL traversing property which is used strictly for dryland agricultural uses and on which no change in land use is anticipated, experiences no reduction in value. Properties with potential for rural residential use or development of an irrigation system, that is, a change in land use, may experience a reduction in value.

The HVETL which is being studied herein, the Calgary to Lethbridge line, traverses regions which are mainly utilized for dryland agriculture. However, some of the region is irrigated and some has a mountain view. Therefore, based upon the previous studies, no concrete conclusions can be reached regarding injurious affection along the entire route.

Data Collection

The material in this section is presented in three sub-sections. The first describes the characteristics of the Calgary-Lethbridge segment of the newly constructed HVETL. Both agricultural characteristics and characteristics of the HVETL are included. Characteristics of selected regions of south and central Alberta which are traversed by an HVETL are also presented. The second sub-section outlines the sales data collected. Included are sale prices and opinions of landowners involved with a sale of an encumbered property. The third sub-section describes data collected from a random sample of landowners who own property which is either encumbered by an HVETL or which is close to an HVETL.

Regional and HVETL Characteristics

Agricultural land use characteristics along the newly constructed HVETL between Calgary and Lethbridge are presented. HVETL characteristics are also presented. Based upon these characteristics, other

regions of the province, which are traversed by an HVETL, were selected. Because no two regions of the province are identical, selected regions have some similar characteristics and some differences compared to the Calgary-Lethbridge region. Two main sources of information were used to select the other regions to study. The first source was a provincial map published by the Energy Resources Conservation Board (1981) which shows the location and nominal operating voltages of power lines over 60 KV. The second source was a Soil Capability for Agriculture Map (Environment Canada), which shows the soil classification for agricultural use and which includes the entire province. Based upon these information sources, three regions of south and central Alberta were selected for analysis. Each region was selected because of similarities with some aspects of the Calgary-Lethbridge region. Table 3.2 describes some characteristics of the regions. Table 3.3 outlines selected characteristics of the power lines which traverse the selected regions. Information in Table 3.3 was mainly obtained from ERCB.

The High River segment was selected because of the number of similarities between it and the Calgary-Lethbridge segment. One difference is the better mountain view along the High River segment. The choice of the Airdrie segment was based, in part, on the lack of mountain view and lack of irrigation. Certain segments of the Calgary-Lethbridge line do not have a good mountain view and do not appear to have irrigation potential. The Taber segment was selected because of the irrigation potential in the area. Some segments of the Calgary-Lethbridge segment have irrigation potential and a power line through such a region was desired for testing. One shortcoming of the Taber segment is because the structures are wooden poles. The impact of wooden poles on the consumptive component of demand may differ from the impact of metal towers. Because the Calgary-Lethbridge segment is constructed of metal towers, comparable lines constructed of metal towers are preferred. However, no additional HVETL's were located which have metal towers and which cross irrigated areas or areas with irrigation potential.

Table 3.2

Selected Characteristics of Four Regions in South Central Alberta

	Cal-Leth	High River	Airdrie	Taber
Canada Land Inventory Classification	2 and 3	2 and 3	1 to 3	1 to 3
Annual Precipitation (cm)	43	48	44	37
Average Frost-Free Period	106-120	68-102	102-106	127
Irrigation	Some	Some	None	Some
Mountain View	Slight	Yes	Slight	No

Table 3.3

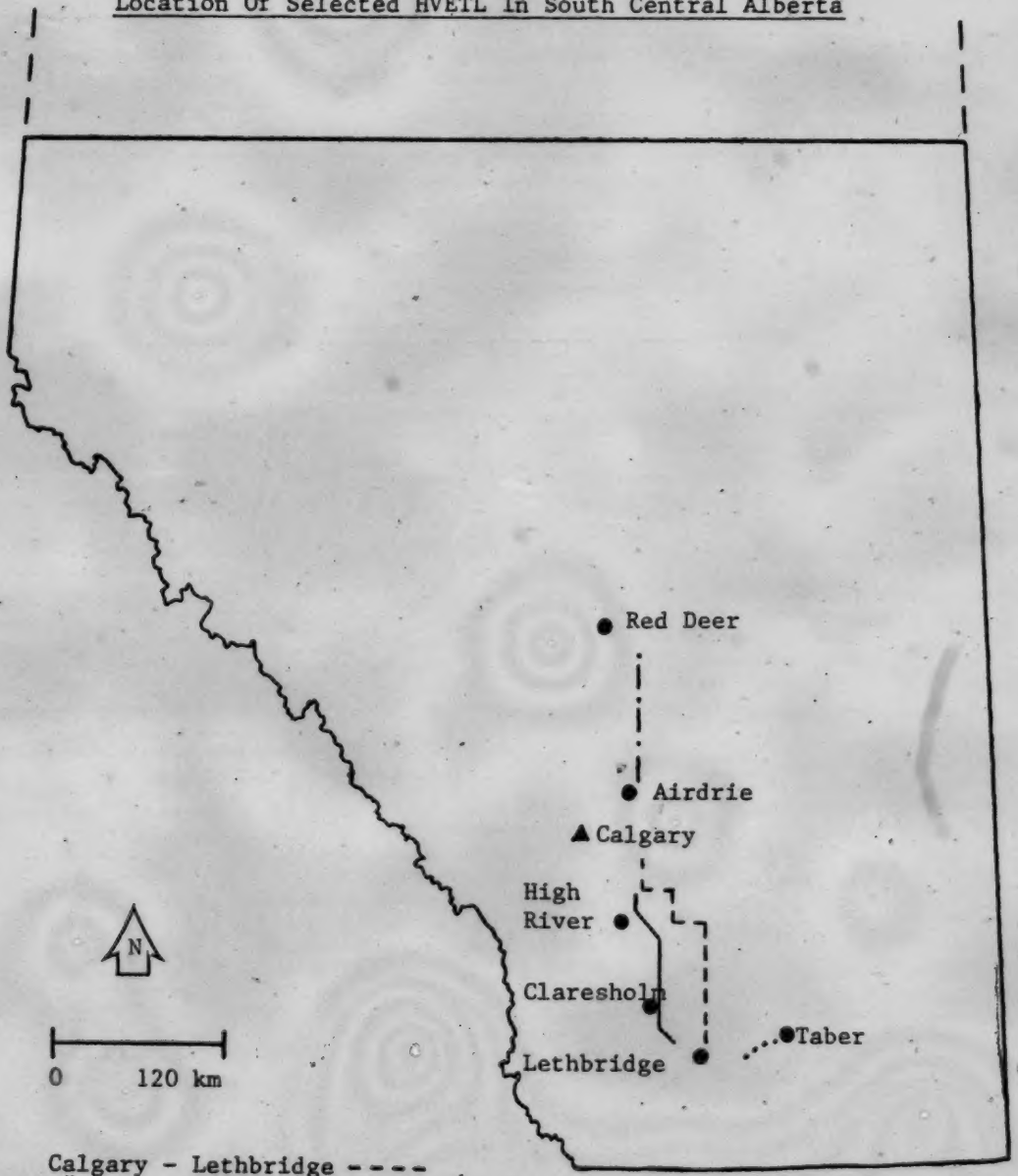
Selected Characteristics of the Power Lines Which Traverse the Four Regions

	Cal-Leth	High River	Airdrie	Taber
Sets of Towers	1	1	2	1
Tower Material	metal	metal	metal	wood
Voltage	240 KV	240 KV	240 KV	69 KV
Date Constructed	1978-80	1969	1979*	1952

* This is the date the second HVETL was constructed.

Map 3.1

Location Of Selected HVETL In South Central Alberta



Calgary - Lethbridge - - - -

High River ——

Airdrie —.—.—.

Taber . . . .

SOURCE: Energy Resources Conservation Board (1981)

In summary, based on similarities with the Calgary-Lethbridge segment, three regions of south central Alberta which are traversed by at least one power line were selected. Sales data are collected for each of the three regions.

Sales Data

Based upon the review of previous studies, the use of primary sales data is considered most appropriate. Primary sales data consist of "arm's-length" sales which were confirmed during the course of this study. A trade-off exists between using secondary sales data which may include "arm's-length" and non "arm's-length" sales, but for which there are more observations, as compared with using primary sales data. In order to supplement the primary sales data, a questionnaire is utilized to extract opinions from landowners who have been involved with a sale which is encumbered by an HVETL. These questionnaire results are compared to the results of the statistical analysis of the sales data collected for this study and may or may not reinforce the statistical findings. The questionnaire results are also useful to analyze which rights landowners believe are impacted by an HVETL.

In order to compare sales of agricultural properties with an HVETL to those without an HVETL, the three described HVETL segments in central and southern Alberta were selected for analysis. Sales which occurred from 1976 to 1981 and were encumbered by an HVETL were identified by obtaining Certificates of Title for all such encumbered properties from either the Calgary or Edmonton Land Titles Office. Further documentation was obtained for those titles which had transferred or which had a charge registered against the title and which may have been associated with a sale. Either purchaser or vendor of a particular sale was then contacted to confirm that the sale was "arm's-length" and also confirm sale details.

Table 3.4 shows the approximate length of each segment, the number of transfers and the number of "arm's-length" sales. No "arm's-length" sales were found on the Taber segment and hence, further analysis was not completed for the Taber area. A total of 26 sales of encumbered

Table 3.4

Number of Sales of Encumbered Properties

Along the High River and Airdrie Regions

	High River	Airdrie
Length of HVETL studied	95 km	95 km
# title transfers	58	31
# "arm's-length" sales	18	8

Table 3.5

Number of Selected and Completed Questionnaires

From the Random Sample

	# Selected	# Interviewed
High River	56	38
Airdrie	44	31
TOTAL	100	69

properties were found. Of these 26 sales, some of the titles had transferred and some were sold by agreement for sale. The titles to those properties which sell by agreement for sale are not transferred, rather, a caveat is registered as a charge against the title. Therefore, when searching for sales, the interests registered against the title must also be checked to determine whether or not a property has sold by agreement for sale.

Sales of unencumbered properties close to an HVETL were obtained to compare to the sales of encumbered properties. These unencumbered sales were obtained from sales files of Deloitte Haskins & Sells Associates (DH&SA). DH&SA obtained the sales for the purpose of appraising various properties. In addition to the sales from DH&SA files, other titles were checked in an attempt to identify additional off-line sales. An analysis of the sales data is presented in Chapter IV.

At the same time the sales of properties encumbered by an HVETL were confirmed, a questionnaire was completed. There are 26 completed questionnaires which ask whether the HVETL affected the sale price or affected other rights of the property. A copy of the questionnaire is included in Appendix I. Chapter IV presents analysis of these questionnaires.

Random Sample Procedures

A random sample of landowners who own property encumbered by an HVETL or close to an HVETL was completed. The purpose of the random sample is to compare opinions of those involved in sales to opinions of other randomly selected landowners. Also, more data regarding impact of an HVETL on close properties was desired. Further investigation of which rights are impacted by an HVETL is desirous for planning and for compensation determination purposes.

The sampling unit for the random sample is a quarter section. Each quarter section within two miles of either side of the encumbered parcel is included in the population. The choice of a two mile width

on both sides of the HVETL was made after discussions with landowners involved with sales revealed that most impacts are within one mile of the HVETL. A width of more than one mile was selected to ensure that impacted properties were not excluded. Each quarter section in the population was assigned a number. The total number of quarters in the High River population is 990, and in the Airdrie population, 972, for a total of 1,962 quarter sections. One hundred numbers were then randomly selected. The random numbers were matched with their appropriate quarter section and the Certificates of Title, from Land Titles offices, were searched. The registered owner of the property, or lessee, was contacted either in person on their farm or by telephone. Of the 100 selected properties, questionnaires for 69 were completed. The major reason for not interviewing the entire 100 people was inavailability of the owner when interviewing was being completed. Table 3.5 shows the number of questionnaires per region.

Because the sampling unit is a quarter section, care was taken to ensure that interview discussions pertained to the randomly selected quarter. In many instances, the landowner held other land in the area, some encumbered and some unencumbered by the HVETL. In these cases, increased effort was made to restrict responses to those applying to the selected quarter only.

One of the objectives of the random sample is to investigate how far any impacts carry to nearby properties. As previously discussed, a width of two miles on each side of the HVETL was sampled. In order to analyze the results in a meaningful manner, each quarter section was numbered from one to nine. Parcel number five is always the quarter encumbered by the HVETL. Parcel number four is adjacent to number five and on the east side. Parcel number one is the furthest quarter east. Parcel number six is adjacent to the encumbered quarter on the west while parcel number nine is the furthest quarter to the west. Figure 3.1 illustrates this parcel numbering.

Table 3.6 shows the number of quarters in each of the nine groups for which questionnaires were completed. A breakdown by region is also

illustrated in the Table. A copy of the random sample questionnaire is included in Appendix II. Information collected includes distance to roads, towns and nearest city. Real property characteristics include a description of property attributes. Results of the opinions of landowners are presented in Chapter IV.

The collected data is analyzed in order to answer the question of whether an HVETL does reduce the value of agricultural land. This analysis, and the results, are presented in Chapter IV.

Figure 3.1

Parcel Numbering for the Random Sample

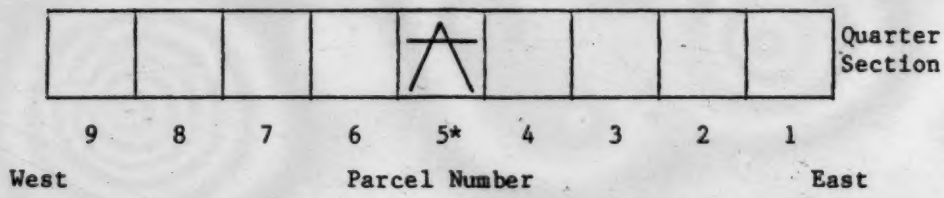


Table 3.6

Number of Completed Random Sample Questionnaires by Region

Parcel Number	Number of Completed Questionnaires		
	Total	High River	Airdrie
1	10	7	3
2	6	4	2
3	4	1	3
4	12	5	7
5 (encumbered)	8	6	2
6	9	6	3
7	4	1	3
8	9	6	3
9	7	2	5
	69	38	31

IV. DATA ANALYSIS AND RESULTS

The data collected is analyzed using various techniques. First, the sale prices of properties with an HVETL are compared to the prices of similar properties which do not have an HVETL. Second, results of the questionnaires which deal with participants of encumbered sales transactions are analyzed. Third, the findings of the random sample questionnaire are presented. The fourth section in this chapter compares the results of the first three sections.

Sale Price Analysis

The sale prices of confirmed "arm's-length" encumbered properties are compared to the sale prices of unencumbered properties. Various analytical techniques are utilized. These techniques include comparison of sample means of meaningfully paired observations, appraisal techniques and multiple regression analysis.

Sample Means and Appraisal Techniques

Before the comparison of sample means of meaningfully paired observations and appraisal technique tests were performed, the sale prices were converted to 1981 levels in order to compare the differences in dollar amounts between pairs. Two sources of appreciation rate data were checked. The first source was Deloitte, Haskins and Sells Associates (DH&SA) data bank of confirmed sales. The province of Alberta is divided into various regions. The appreciation rate per year was obtained for the years 1976 to 1981, inclusive, for the subject regions. The second data source was the Agricultural Real Estate Values in Alberta publications (Alberta Agriculture, 1976 to 1981). The average per acre value for the relevant Counties and Municipal Districts were averaged to obtain appreciation rates for the High River region and the Airdrie region. The data which these publications utilize contains both "arm's-length" and non-"arm's-length" transfers of property. Some large differences were evident between the two sources. The average rate over the five years was, however, fairly similar. Because the DH&SA data contains only confirmed "arm's-length" sales, their data was used to adjust the

prices to 1981 levels. Table 4.1 outlines the appreciation rate calculation. The area which is included with the heading "View of Mountains" includes Township 1 to Township 44 and a width of approximately 45 miles which includes Granum and High River. Included in the heading "Corridor" is a width of approximately 45 miles which includes the area between Calgary and Edmonton and is 120 miles in length. The appropriate factor from Table 4.1 was multiplied by the per acre sale price to convert the values to 1981 levels. Once all sales were on a common dollar basis, analysis was undertaken.

One Best Comparable: This technique involves finding the one most similar comparable (no HVETL) to a subject (encumbered with an HVETL) in all attributes of the property which influence sale price. Adjustments to the sale price of the comparable are made for apparent dissimilarities between the comparable and the subject.[8] The difference of means, meaningfully paired observations technique of analysis, was then used to determine if the price of encumbered properties is significantly lower than that of unencumbered properties. Table 4.2 presents results of this technique. The number of pairs is less than the total of 26 because a good comparable was not found for each encumbered property. The calculated t statistic for the High River segment is significant at the 2.5% level. The calculated t statistic for the Airdrie segment is not significant at the 10% level. In other words, we can be quite sure that the value of encumbered properties is lower than unencumbered properties along the High River segment. We cannot, however, suggest that the value of encumbered properties along the Airdrie segment is less than the value of unencumbered properties.

Average of Adjusted Comparables: This technique involves comparing the average (mean) of the adjusted unencumbered comparables with the price of the subject (encumbered) property on a paired basis. This technique may be preferred to the One Best Comparable technique

[8] For a complete discussion of the technique see Appraisal 101 Manual, Appraisal Institute of Canada, 1980.

Table 4.1

Appreciation Rates - 1976 to 1981 -

for Two Regions

View of Mountains

Year	# of sales	$/Acre	% Increase	Factor
1976	35	$268.17		3.57
			10.14%	
1977	64	$295.38		3.24
			42.35%	
1978	77	$420.45		2.28
			36.18%	
1979	81	$572.58		1.67
			29.13%	
1980	90	$739.36		1.30
			29.62%	
1981	11	$958.36		1.00

Corridor

Year	# of sales	$/Acre	% Increase	Factor
1976	36	$347.53		2.83
			4.13%	
1977	98	$361.88		2.72
			18.77%	
1978	85	$429.80		2.29
			51.51%	
1979	77	$651.18		1.51
			30.94%	
1980	86	$852.63		1.15
			15.39%	
1981	23	$983.83		1.00

Table 4.2

Results of Paired Comparison

One Best Comparable

Region	# of pairs	Mean $/Acre HVETL	Mean $/Acre no HVETL	t statistic	degrees of freedom
High River	11	1,033	1,134	-2.23*	10
Airdrie	7	1,226	1,262	-1.13	6

* Significant at the 2.5% level.

Table 4.3

Results of Paired Comparison

Average of Adjusted Comparables

Region	# of pairs	Mean $/Acre HVETL	Mean $/Acre no HVETL	t statistic	degrees of freedom
High River	7	1,055	1,178	-1.66*	6
Airdrie	6	1,339	1,385	-1.17	5

* Significant at the 5% level.

price of the subject (encumbered) property on a paired basis. This technique may be preferred to the One Best Comparable technique because extreme sale prices will be averaged. In all cases, two comparables are adjusted to each subject. Table 4.3 shows results of the Average of Adjusted Comparable technique. The number of pairs is reduced because two good comparables were not found for each subject.

Similar Sales - No Adjustments: This technique involves setting criteria for similarity between the subject and a comparable. Comparables which meet the criteria are not adjusted via the appraisal method. Criteria selected are based, to a large extent, on the paper by Brown (1975). The criteria include: date of sale - ± one year; size - ± 25%; buildings - maximum of $10,000.00; soil - ± one C.L.I. classification; % cultivation - ± 15%; location - within six miles of each other; access - on gravel or paved road; towns - both at least two miles from a shipping point.

The selling prices of pairs which meet the above criteria are compared to each other with no adjustments for dissimilarities. Because of the number of criteria which must be similar, only one pair meets all criteria for the High River segment. Four pairs meet the criteria for the Airdrie segment and five pairs for the combined Airdrie and High River segments. Results are presented in Table 4.4.

Results show the selling price of encumbered properties is less than unencumbered properties. However, only the combined sample has a significantly lower price at the 10% level of significance.

One Best Comparable - Irrigation Potential: A consistent finding thus far is the price of encumbered properties along the High River segment appears to be impacted more than the price of properties along the Airdrie segment. Two obvious differences between the two regions are irrigation potential and mountain view. The High River segment has these characteristics. In order to test which of, or whether both of these characteristics are important, the pairs along the High River segment are divided into two groups. The first group consists of

Table 4.4

Results of Paired Comparison

Similar Sales - No Adjustments

Region	# of pairs	Mean $/Acre HVETL	Mean $/Acre no HVETL	t statistic	degrees of freedom
Airdrie	4	1,307	1,379	-1.12	3
Combined	5	1,187	1,331	-1.65*	4

* Significant at the 10% level.

Table 4.5

Results of Paired Comparison

One Best Comparable - Irrigation Potential

High River	# of pairs	Mean $/Acre HVETL	Mean $/Acre no HVETL	t statistic	degrees of freedom
Irrigation Potential	5	945	1,119	-2.63*	4
Remainder	6	1,106	1,147	-0.74	5

* Significant at the 5% level.

encumbered sales which the buyers feel have potential for irrigation. The second group consists of the balance of encumbered sales along the High River segment. The same prices are used as calculated for the One Best Comparable test which was previously completed. Results are presented in Table 4.5. The value of encumbered property with irrigation potential is, at the 5% level, significantly less than the value of unencumbered properties along the High River segment. In the absence of irrigation potential, aesthetic value may have appeared stronger.

The finding outlined in Table 4.5 shows the value of property which is encumbered by an HVETL and which the landowner feels has irrigation potential, is significantly less than the value of comparable unencumbered property. The configuration of the HVETL may be quite important in whether an HVETL reduces property value. Therefore, configuration of the HVETL on the five properties which the landowners feel have irrigation potential is considered. The HVETL traverses three of the properties diagonally. The HVETL is parallel to the boundary of the other two properties but is located approximately one quarter of the way into the property (approximately 600 feet from the property boundary). In all five of these instances, the use of a quarter section pivot irrigation system is virtually eliminated because of the HVETL. Other types of irrigation systems, such as a wheel roll or a smaller pivot, could be used to irrigate portions of each of the five properties.

No encumbered sales with the HVETL parallel to and on the property boundary which the landowner feels has irrigation potential were found. Therefore, impacts of parallel configurations of HVETL which are on the property boundary of land with irrigation potential were not studied.

Multiple Regression Analysis

The sales data was analyzed using the ordinary least squares multiple regression technique. A linear functional form was used. As discussed in Chapter III, sale prices can either be converted to a

common date or an independent variable for date of sale can be included in the model. Both procedures are followed. The factors outlined in Table 4.1 are utilized to convert the prices to 1981 levels. The dependent variable, 1981 prices, is the bareland price per acre converted to the 1981 level. The second procedure of including date of sale as an independent variable was accomplished by numbering each month, starting with January, 1976, from one to seventy-two. The dependent variable is the actual sale price. Results from these two procedures are not expected to differ substantially. The number of observations is 74 of which 26 properties are encumbered and 48 are unencumbered. The dependent variable is either the actual bareland per acre sales price or the bareland per acre sales price converted to the 1981 level. Independent variables include those discussed in Chapter II. Table 4.6 shows the variables included in the following regression analysis. Following is a brief discussion of each independent variable and some results which pertain to that variable. Tables 4.7, 4.8 and 4.9 show results of five different regression equations. The significance of the regressors is shown for the 10%, 5% and 1% levels.

Region: The first independent variable, in Equation 1, to enter the stepwise regression is region. This is a dummy variable distinguishing between the High River (coded as 1) and the Airdrie (coded as 0) segments. The average bareland per acre price in 1981 dollars along the Airdrie segment is $1,400.02 and is $864.03 along the High River segment.

Distance to City: This variable is the distance, in miles from the nearest city (population of at least 250,000). As expected, for each mile further away from a City, the price dropped. At the mean distance from a City of 57 miles, the price dropped $8.48 per mile as distance from the City increased.

Percent Cultivated: The percentage of the sale parcel which is cultivated has a positive coefficient which indicates that as % cultivated increases, the price increases. At the mean of 0.86, the

Table 4.6

Variables Included in the Multiple Regression Analysis

Dependent Variables

- Bareland Price Per Acre (1981 Dollars)
- Actual Bareland Per Acre Sale Price

Independent Variables

- Region
- Distance to City
- Population Distance
- Date of Sale
- Parcel Size
- Soil Rating
- Percent Cultivated
- Two HVETL
- One HVETL
- Diagonal HVETL
- Parallel HVETL
- Presence of an HVETL
- None, One or Two HVETL
- Number of HVETL towers
- Length of HVETL
- Petroleum Wellsite
- Pipeline
- Railway Severence
- Road Severence
- Service Power Line

Table 4.7

Results From Regression Equation #1

Dependent Variable is Bareland Price
Per Acre (1981 Dollars)

Independent Variables Which Entered the Equation
When the Adjusted R^2 was Largest

	Expected Sign of B	B	Std. Error B	t statistic
Intercept		1,400.02		
Region	-	-535.99	64.08	-8.36***
Distance to City	-	-8.48	1.54	-5.50***
Percent Cultivated	+	+452.00	127.40	3.55***
Population - Distance	+	+0.0886	0.0289	3.06***
Petroleum Wellsite	?	-487.44	164.50	-2.96***
Soil Rating	-	+82.57	36.80	2.24**
Two HVETL[9]	-	-151.79	88.27	-1.72*
Diagonal HVETL	-	-116.69	89.31	-1.31
Service Power line	?	+95.11	67.55	1.41
Road Severance	?	+279.83	216.92	1.29

Overall F is 11.42 (10,63) - significant at the 1% level.

R^2 is 64.44%.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Coefficients, standard errors and t statistics are calculated after the ten independent variables have entered the equation.

9 This regression equation was also calculated with the variable None, One or Two HVETL replacing the two dummy variables - One HVETL and Two HVETL. The B coeffecient for the None, One or Two HVETL variable is -64.21, the std. error of B is 37.75 and the t statistic is -1.70. All of the coefficients and sign levels were otherwise of the same magnitude as reported in Table 4.7.

per acre price increased by $4.52 for each increase of 1% in cultivated area.

Population Distance: This is a variable which considers both population of and distance to the nearest town with grain elevators. The variable is generated by dividing population of the nearest town by distance to that town. A larger population of the town is expected to increase sale price. An inverse relationship is expected between number of miles to the town and price per acre. Therefore, a positive coefficient is expected. The mean of the variable is 709. If population of a town with 700 people increased by 100, the per acre price of a parcel located one mile from the town is expected to increase by $8.86 per acre. Conversely, the increase in per acre price between a parcel which is four miles from a town of 3,500 instead of five miles is approximately $15.50 per acre.[10]

Petroleum Wellsite: The expected sign of the coefficient of this dummy variable for petroleum wellsite is unknown depending, among other things, upon whether or not annual compensation is paid, amount of annual compensation, wellsite and roadway configuration and whether the property is pasture or cultivated area. The results of the data indicate that per acre price is reduced by the presence of a wellsite. However, without knowing and describing all relevant factors describing the wellsite, the parcel and compensation, caution should be exercised in interpreting the results.

Soil Rating: Soil rating is described by the Canada Land Inventory for Agriculture rating for the property. A higher rating indicates more restrictions for agricultural use. Therefore, a negative coefficient is anticipated. A positive coefficient was calculated. A possible explanation for this finding is properties in long, relatively narrow strips were analyzed. The C.L.I. ratings basically vary from Class 1 to Class 3 (18% are C.L.I. Class 1, 54% are Class 2

[10] These figures apply within the range of values used in the regression and may not apply to extremes.

and 23% are C.L.I. Class 3). Soils in these three classes are all relatively good lands for agriculture. If soils #1 to #7 were compared for the entire province, a negative coefficient may be obtained.

Two HVETL: A dummy variable which indicates whether two sets of HVETL's are present is included. The expected and obtained sign of the coefficient is negative. Therefore, two HVETL's appear to reduce price more than one HVETL.

Diagonal HVETL: A dummy variable which describes whether an HVETL diagonally crosses a property is included. A negative coefficient is expected because an HVETL which diagonally crosses a property is expected to reduce the price of the property. An analysis of the questionnaires shows that no annual compensation is paid to landowners whose properties have been included. Therefore, properties which are diagonally crossed by an HVETL and for which no annual compensation is paid appear to experience a lower price of approximately $116.00 per acre.

Service Power Line: This independent variable indicates whether or not a service power line is on the sale property. The expected sign of the coefficient is unknown because the service power line may add utility and hence value to the property or may reduce value if wooden power poles are in fields. The observed sign is positive which indicates that service power lines add value to the properties.

Road Severance: The expected sign of the coefficient for the dummy variable for road severance is unknown. Road severance may create small, irregular shaped fields and hence reduce utility from a strictly agricultural view. However, smaller parcels with good access may be created. The per acre price of these small parcels may increase as a result of the severance. The observed sign of the coefficient is positive.

Date of Sale: Each month was assigned a sequential number starting in January, 1976 and ending in December, 1981. The coefficient indicates values have appreciated by $12.42 per month at the mean date of April, 1979. This magnitude of increase equates to approximately 20% per annum.

Parallel HVETL: A dummy variable describing whether or not the HVETL is parallel to a property boundary is included. The expected sign of this dummy variable is negative. The observed sign is positive (see Table 4.8). The result may be interpreted as properties with HVETL which are parallel to the property boundary sell for a higher price.

Parcel Size: This variable records the number of acres in a transaction. The independent variable is always dollars per acre. Therefore, the expected sign of the coefficient is negative because smaller parcels usually sell for a higher amount per acre. An exception may occur if larger parcels, perhaps because they represent a farm unit, demand a higher per acre price. Given this scenario, the expected sign of the coefficient is positive. This variable is not significant in explaining variation in sale price per acre (Equation One, $t = 0.234$; Equation Two, $t = 0.184$).

Number of HVETL Towers: This variable records the number of HVETL towers on a property. The expected sign of the coefficient is negative because an increasing number of towers is expected to reduce price. This variable did not enter Equation One and is not significant in explaining variation in per acre sale price in Equation Two ($t = 0.261$). However, high correlation coefficients (0.81 to 0.87) are reported between this and other variables which describe the HVETL.

Presence of an HVETL: A dummy variable for presence of an HVETL is included. The expected sign of the coefficient is negative. This variable did not enter either Equation One or Two. However, there is a high correlation between this and other variables which describe characteristics of the HVETL. Therefore, Equation Four includes this as the only variable which describes the HVETL. The obtained sign

Table 4.8

Results From Regression Equation #2

Dependent Variable is Actual Bareland
Per Acre Sale Price

Independent Variables Which Entered the Equation
When the Adjusted R^2 was Largest

	Expected Sign of B	B	Std. Error B	t statistic
Intercept		579.50		
Date of Sale	+	+12.42	1.13	10.99***
Region	-	-421.25	41.55	-10.14***
Distance to City	-	-4.60	0.97	-4.75***
Population - Distance	+	+0.060	0.0177	3.42***
Two HVETL[11]	-	-224.54	75.69	-2.97***
Road Severance	?	+227.60	137.54	1.65
Parallel HVETL	-	+91.20	51.05	1.79
Petroleum Wellsite	?	-163.29	101.14	-1.61
Percent Cultivated	+	+108.43	77.94	1.39
Soil Rating	+	+28.13	24.37	1.15

Overall F is 38.03 (10,63) - significant at the 1% level.

R^2 is 85.79%.

*** Significant at the 1% level.

11 This regression equation was also calculated with the variable None, One or Two HVETL replacing the two dummy variables - One or Two HVETL. The B coefficient for the None, One or Two HVETL variable is -36.91, the std. error of B is 23.60 and the t statistic is -1.56. All of the coefficients and sign levels were otherwise of the same magnitude as reported in Table 4.8.

from Equation Four is negative and the calculated t value is -1.345. Further interpretation of Equation Four follows Table 4.9.

Length of HVETL: This variable describes the length of the HVETL. High correlation coefficients (0.81 to 0.91) are obtained between this variable and other variables which describes HVETL characteristics.

Railway Severance: Railway severance is described by a dummy variable. The expected sign of the coefficient is negative because the railway may create smaller and irregular shaped fields. This variable is not significant in explaining variation in sale price (Equation One, t = 0.658 and Equation Two, t = 0.212).

Pipeline: A dummy variable which records the presence of a pipeline is included. Based upon previous research (DH&SA, 1982), the presence of a pipeline is not expected to affect the price. This variable did not enter Equation Two and entered equation one but is not significant (t = 0.539) in explaining variation in the dependent variable.

One HVETL: A dummy variable which records whether or not a single HVETL traverses the property is included. Because of a high correlation coefficient, this variable and the variable for two sets of HVETL were the only variables describing an HVETL which were entered in Equation Three. Results are presented in Table 4.9. The observed sign of the coefficient is negative and the t value is 0.366.

None, One or Two HVETL: A variable coded as zero for properties with no HVETL, one for properties encumbered by one HVETL and two for properties encumbered by two HVETL is included. An assumption with this variable is the impact on value of a property encumbered by two HVETL is double the impact on property value of a property encumbered by a single HVETL. The expected and observed sign of the coefficient is negative.

Results: Tables 4.7 and 4.8 present results of Equations One and Two. The dependent variable in Equation One is the bareland price per

acre, in 1981 dollars. The calculated F statistic for Equation One is 11.42 which is greater than the theoretical F at the 0.05 level of significance and hence indicates that the null hypothesis is rejected. In other words, we accept the regression as significant. The R^2 of 64.44% indicates that approximately 65% of the variation in per acre price is explained by the independent variables.

Results of Equation Two are presented in Table 4.8. The actual bareland per acre sale price is the dependent variable. The overall F statistic is quite high at 38 as is the R^2 of 85.79%.

Regressions with Various HVETL Variables: Previous study results appear to indicate that HVETL's may, depending on numerous factors, reduce agricultural property value. Four regression equations are therefore reported which include different variables for measuring characteristics of the HVETL's.

Results of the four equations are presented in Table 4.9. All signs of the coefficients are as expected. The parallel HVETL variable has a negative coefficient as expected. This result differs from the calculated sign of the coefficient for Table 4.8. Coefficients for other variables are relatively similar to those in Table 4.7 and so will not be discussed.

Equation Three includes the two dummy variables describing whether there are two HVETL or a single HVETL. The calculated t statistic for two HVETL is -1.68 and for a single HVETL is -0.37. Therefore, two sets of HVETL's appear to have a greater effect on property values than a single HVETL.

Equation Four includes the presence of an HVETL dummy variable as the only variable describing an HVETL. This variable equals zero if there is no HVETL on the property and equals one if the property is encumbered by an HVETL. Both the High River and Airdrie segments are included. The calculated t statistic is -1.345.

Equation Five includes the two dummy variables describing parallel HVETL configuration and diagonal HVETL configuration. The calculated t statistic for parallel configuration is -1.07 and for diagonal configuration is -1.02.

Equation Six includes the None, One or Two HVETL variable. The calculated t statistic is -1.63 which is significant at the 10% level (one tail test). The coefficients obtained from equation three suggest the impact on value of two HVETL is more than double the impact on value of a single HVETL. Therefore, the assumption of twice the impact from two versus one HVETL may not be appropriate.

Comparison of Sale Price Results

Results from the sale price analysis are compared. Table 4.10 shows results of the various techniques of analyzing the sale prices. Considering the High River segment, the null hypothesis of no difference, in three of the four analyses, is rejected at the 5% significance level. The analysis which distinguishes between irrigation potential appears to highlight the reason why parcels with an HVETL appear to sell for a lower value. Prices of those parcels which have irrigation potential and are encumbered by an HVETL are significantly less than prices of unencumbered properties. There is no significant difference between the prices of encumbered properties which do not have irrigation potential and unencumbered properties.

Comparison of the calculated t statistics for the Airdrie segment show that all three methods of analysis yield similar results. Although the price of encumbered properties is less than unencumbered properties in all three analyses, the null hypothesis cannot be rejected at the 10% significance level.

Results of the multiple regression analysis and the similar sales - no adjustment technique pertain to the combined High River and Airdrie segments. Considering the similar sales, no adjustment technique, at the 10% significance level, the null hypothesis is rejected. The alternative hypothesis, which is one-tail, is accepted.

Table 4.9

Results of Regressions with Various HVETL Variables

Regression Equations Three, Four, Five and Six

Variable	Expected Sign of B	Equation Three	Equation Four	Equation Five	Equation Six
Intercept (B_0)		$1,466.50	$1,407.69	$1,405.48	$1,438.20
- Region	-	-421.59[1] (67.51)[2]	-381.60 (56.61)	-377.88 (58.42)	-399.60 (55.82)
- Distance to City	-	-5.58 (1.48)	-5.37 (1.47)	-5.43 (1.49)	-5.48 (1.46)
- Percent Cultivated	+	+323.72 (127.71)	+352.14 (125.14)	+356.05 (126.72)	+339.05 (124.38)
- Population Distance	+	+0.087 (0.031)	+0.090 (0.031)	+0.091 (0.032)	+0.090 (0.031)
- Two HVETL	-	-162.23 (96.43)			
- One HVETL	-	-27.92 (76.20)			
- Presence of an HVETL	-		-79.81 (59.34)		
- Parallel HVETL	-			-71.39 (66.45)	
- Diagonal HVETL	-			-103.39 (100.98)	
- None, One or Two HVETL	-				-65.73 (40.22)
R^2		52.75%	51.92%	51.98%	52.51%
Overall F		12.47[3]	14.69[3]	12.09[3]	15.04[3]
Degrees of Freedom		F(6,67)	F(5,68)	F(6,67)	F(5,68)

[1] B

[2] Std. Error of B.

[3] Significant at the 1% level.

Results of the regression analysis reported in Table 4.7 indicate the variable for two HVETL and the variable for a diagonal HVETL are significantly less than 0 at the 10% level of significance. The variable describing two HVETL represents all properties along the Red Deer segment as that segment includes two HVETL's while the High River segment includes only one HVETL. Therefore, the calculated t statistics can be compared to the other statistics for Airdrie. Further, the results from the single HVETL variable can be compared to other statistics calculated for the High River segment. Results from Equation Four indicate the variable describing presence of an HVETL is significantly less than 0 at the 10% level.

The results in Table 4.10 do suggest that the price of some encumbered properties is significantly less than unencumbered properties. The unique characteristics of the parcel, including anticipated use, whether diagonal or parallel configuration and whether one or two HVETL's are present appear to be important variables which influence whether the value of a specific property is reduced or not. Landowner opinions may be useful in further assessing the reasons for impact.

Questionnaire Results of Encumbered Sales

One purpose of obtaining opinions of sales participants of encumbered properties is to supplement the sales data. The opinions presented are those of landowners who were involved in a sale of property which is encumbered by an HVETL and which took place from the years of 1976 to 1981. These opinions were collected when the sale was being confirmed to ensure the use of "arm's-length" transactions only.

The sampling unit which this analysis is based upon is a transaction. The number of acres involved in a transaction may vary. In order to analyze the effects of an HVETL, four groups of transaction size werecreated. The reason for the four groups is to compare the perceived impact of an HVETL on a transaction which involves a quarter section with the perceived impact on a transaction which involves more land. The four size categories and number of completed questionnaries from the two regions are shown in Table 4.11.

Table 4.10

Results of Sales Price Analysis

High River

	Calculated 't' statistic
One Best Comparable (Table 4.2)	-2.23***
Average of Adjusted Comparables (Table 4.3)	-1.66**
Irrigation Potential - Yes	-2.63***
- No	-0.74

Airdrie

	Calculated 't' statistic
One Best Comparable (Table 4.2)	-1.13
Average of Adjusted Comparables (Table 4.3)	-1.17
Similar Sales - No Adjustments	-1.12

** Significant at the 5% level.

*** Significant at the 2.5% level.

High River and Airdrie

Similar Sales - No Adjustments			-1.65*
Regression - 1981 levels (Table 4.7)		- two HVETL	-1.72**
		- diagonal HVETL	-1.31*
- Time As Independent (Table 4.8)		- two HVETL	-2.97***
		- parallel HVETL	+1.79**
- Table 4.9 - Equation Three		- two HVETL	-1.68**
		- one HVETL	-0.37
	Equation Four	- presence of an HVETL	-1.34*
	Equation Five	- parallel HVETL	-1.07
		- diagonal HVETL	-1.02
	Equation Six	- None, One or Two HVETL	-1.63*

* Significant at the 10% level.
** Significant at the 5% level.
*** Significant at the 2.5% level.

The results of the questionnaire are presented in the following tables and discussion. Table 4.12 shows results of whether the HVETL affects the landowner's opinion of his property value. Overall, 61.5% feel the power line decreases property value while 26.9% feel that the power line has no effect on property value. No landowners feel the power line increases their property value. Of interest is the finding that for the size 80 to 170 acres, the proportion of landowners who feel their property value is decreased is similar for both regions. Also, a higher proportion of landowners of 80 to 170 acre parcels, as compared to larger parcels, feel their property value is decreased.

Table 4.13 provides more detail as to the number of towers, line configuration and reasons why some landowners feel their property value is reduced. A common reason why landowners feel their property value is reduced is because irrigation potential may be affected. The perceived amount of impact varies with line placement, expected probability or possibility of obtaining water rights, and expected time until water rights are obtained.

Table 4.11

Number of Questionnaires Per Size Category From Interviews with Market Participants of Encumbered Properties

Size (acres)	High River	Airdrie	Total
80 - 170	10	7	17
171 - 400	3	1	4
401 - 650	3	0	3
651 +	2	0	2
	18	8	26

Table 4.12

Opinions Regarding Impact of the HVETL on Market Value of Property

% of Responses

Size (acres)	High River			Airdrie			Total		
	No Ch.	Decr.	NA	No Ch.	Decr.	NA	No Ch.	Decr.	NA
	- percent -			- percent -			- percent -		
80 - 170	20	70	10	28.6	71.4	0	23.5	70.6	5.9
171 - 400	33.3	33.3	33.3	0	100	0	25	50	25
401 - 650	33.3	66.7	0	0	0	0	33.3	66.7	0
651 +	50	0	50	0	0	0	50	0	50
All Sizes	27.8	55.6	16.7	25	75	0	26.9	61.5	11.5

Table 4.13

Opinions Regarding Whether the HVETL Affects Value of a Property and Reasons for the Impact

Line Segment	Ref #	Size (acres)	# Towers	Configuration	Effect Value	By What %	Reason
H. R.	34	171 - 400	2	Diagonal	Decr.	6-10%	Irrig. Potential
H. R.	35	401 - 650	2	Diagonal	Decr.	6-10	Irrig. Potential
H. R.	36	80 - 170	2	Diagonal	Decr.	11-15	Sales
H. R.	37	80 - 170	2	Diagonal	No Ans.	-	
H. R.	38	401 - 650	3	Diagonal	Decr.	Subst.	Irrig. Potential
H. R.	39	80 - 170	3	Diagonal	Decr.	Subst.	Irrig. Potential
H. R.	40	80 - 170	2	Parallel	Decr.	-	Danger
H. R.	41	171 - 400	4	Parallel	No. Ans.	-	
H. R.	42	651 +	4	Parallel	No Change	0	
H. R.	43	651 +	4	Parallel	No. Ans.	-	
H. R.	45	80 - 170	3	Parallel	Decr.	-	
H. R.	46	171 - 400	2	Diagonal	No Change	0	
H. R.	47	80 - 170	2	Parallel	Decr.	-	Irrig. Potential
H. R.	48	80 - 170	2	Parallel	Decr.	-	Irrig. Potential
H. R.	49	80 - 170	2	Parallel	No Change	0	
H. R.	50	80 - 170	2	Diagonal	No Change	0	
H. R.	80	80 - 170	3	Parallel	Decr.	6-10	Inconvenience
H. R.	81	401 - 650	9	Parallel	No Change	0	
Air	1	80 - 170	4	Parallel	Decr.	16-20	Inconvenience, Bldgs.
Air	6	80 - 170	4	Parallel	No Change	0	
Air	10	80 - 170	4	Parallel	Decr.	-	Bldgs., Health
Air	14	80 - 170	4	Parallel	Decr.	6-10	Inconvenience
Air	19	80 - 170	6	Parallel	Decr.	-	
Air	24	171 - 400	10	Parallel	Decr.	5	
Air	28	80 - 170	6	Parallel	Decr.	16-20	Sales
Air	32	80 - 170	6	Parallel	No Change	0	

Tables 4.14 to 4.16 are included in order to provide answers to the question of which rights are impacted by an HVETL. Each table considers possible impact on one right. These rights include aesthetic value, personal danger and fieldwork operations. Another possible impact, on buildings, is not presented. Of the transactions which included buildings, only one had a residence within one quarter mile of the HVETL. The owner of this particular property feels that the HVETL does affect his buildings. Owners of residences at least one half mile from the HVETL do not feel their buildings are affected. Based upon this limited information, conclusions regarding impact on residences are difficult to draw.

Results from Tables 4.14 and 4.15 are quite similar and so will be discussed together. A higher proportion of market participants who have bought a 80 - 170 acre parcel feel the aesthetic value of the parcel is affected and feel personal danger. Within this smaller size category, results are similar for the two regions.

Table 4.16 shows that of the owners who answered the question, 100% feel that fieldwork operations are affected by the presence of the power line.

Table 4.17 summarizes information regarding the degree of familiarity of purchasers with HVETL's. To summarize, of the Yes-No replies, 76.2% replied that the line was the first power line they have been involved with, 72.7% of respondents said the HVETL did <u>not</u> affect the transaction, 21.1% said the HVETL <u>did</u> reduce the price of the property and 80.9% said that if they were involved in a transaction which had a power line again, the power line <u>would affect</u> the transaction (purchase of sale price). Appendix III contains specific results by size category and by region for three of the questions summarized in Table 4.17.

Table 4.14

Opinions Regarding Impact of HVETL on Aesthetic Value

% of Responses

Size (acres)	High River			Airdrie			Total		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
	- percent -			- percent -			- percent -		
80 - 170	60	20	20	57.1	42.9	0	58.8	29.4	11.8
171 - 400	33.3	33.3	33.3	0	100	0	25	50	25
401 - 650	66.7	33.3	0	0	0	0	66.7	33.3	0
651 +	0	50	50	0	0	0	0	50	50
All Sizes	50	27.8	22.2	50	50	0	50	34.6	15.4

Table 4.15

Opinions Regarding Personal Danger Caused by the HVETL

% of Responses

Size (acres)	High River			Airdrie			Total		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
	- percent -			- percent -			- percent -		
80 - 170	70	20	10	71.4	28.6	0	70.6	23.5	5.9
171 - 400	0	66.7	33.3	100	0	0	25	50	25
401 - 650	0	100	0	0	0	0	0	100	0
651 +	0	50	50	0	0	0	0	50	50
All Sizes	38.9	44.4	16.7	75	25	0	50	38.5	11.5

Table 4.16

Opinions Regarding Impact of HVETL on Field Operations

% of Responses

Size (acres)	High River			Airdrie			Total		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
	- percent -			- percent -			- percent -		
80 - 170	100	0	0	100	0	0	100	0	0
171 - 400	66.7	0	33.3	100	0	0	75	0	25
401 - 650	100	0	0	0	0	0	100	0	0
651 +	0	0	100	0	0	0	0	0	100
All Sizes	83.3	0	16.7	100	0	0	88.5	0	11.5

Table 4.17

Opinions Regarding Frequency of Market Involvement

	Yes	No	No Answer
Is this the first power line you've been involved with?	61.5%	19.2%	19.2%
Did the power line affect the transaction in any way?	23.1%	61.5%	15.4%
Was there a price difference in the transaction?	15.4%	57.7%	26.9%
If you were involved in a transaction which involved a power line again, would the power line effect the transaction? (purchase or sale price)	65.4%	15.4%	19.2%

Questionnaire Results of Random Sample

As discussed in Chapter III, one purpose of the random sample is to compare opinions of randomly selected landowners to the opinions of sales participants. Also, data regarding impact of an HVETL on nearby properties is desired.

Most findings in this section are presented in Figures 4.1 through 4.5. Each Figure consists of two diagrams. Diagram one considers No Answer as a response while Diagram two calculates the percent based only on the respondents who answered yes or no. For example, if four landowners responded - Yes, three - No, and two - No Answer, the Yes calculation for Diagram one is 4 ÷ 9 or 44%. The Yes calculation for Diagram two is 4 ÷ 7 = 57%. The findings of the random sample pertain to opinions of the landowners regarding impacts on a specific quarter section. Included in Appendix IV are Tables which provide further a breakdown of the information presented in the Figures.

Figure 4.1 presents results to the question, "Does the power line affect your estimate of the property value?" No landowners of Parcels 1, 2, 3, 7, 8, 9 feel the value of their property is affected by the HVETL. Most landowners whose property is encumbered by the HVETL feel their property value is reduced by the HVETL. Approximately one-third of landowners with adjacent parcels feel their land value is reduced. No landowners feel the HVETL's increase property value.

Figure 4.1

Impact of HVETL on Opinion of Property Value

Diagram 1

% of Total Interviewed Who Feel
the HVETL Decreases Property Value

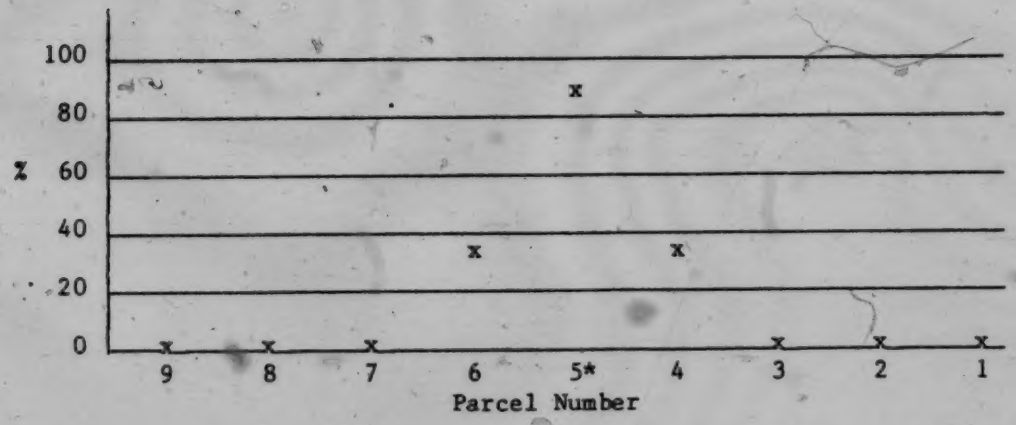
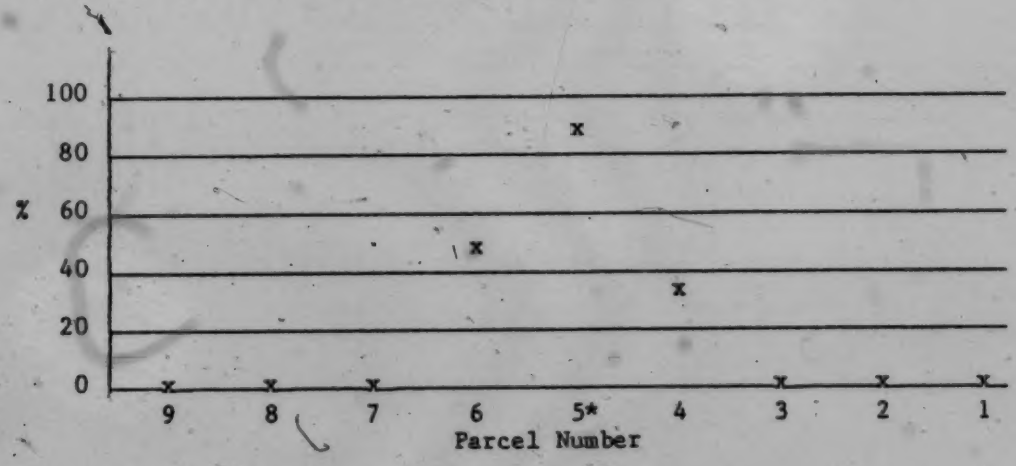


Diagram 2

% of Total Interviewed Who Responded and
Feel the HVETL Decreases Property Value



Answers to the question, "Do you feel your nearest buildings to the HVETL are affected?", shows that the sample did not include numerous properties with buildings close to the HVETL. Considering only those parcels encumbered by the HVETL (Parcel #5), shows that of the sample size of eight, five have no buildings. The three with buildings include one with grain bins only, one in which a lessee lives in the buildings and one residence which is one-half mile from the HVETL. None of the three people interviewed felt their buildings were affected. Two landowners with residences on property adjacent to the HVETL felt their buildings were impacted. Conclusions from these results are difficult to draw.

Results to the question of whether or not the HVETL affects potential building sites on the quarter are presented in Figure 4.2. Generally, some landowners, if their property is within one mile of the HVETL, believe potential building sites are affected. A difference between the Airdrie segment and the High River segment is evident (see Appendix IV.2 for details). Along the Airdrie segment, building sites to the east and within one mile may be impacted. Along the High River segment, parcels numbered 5 and 6 are impacted. The results suggest that not all landowners feel the HVETL affects potential building sites. However, potential effect is greatest on encumbered properties and may affect properties up to one mile away from the HVETL.

Figure 4.3 presents results to the question, "Do you feel the aesthetic value of the quarter is affected?" Approximately two-thirds of landowners of encumbered quarters feel the aesthetic value is reduced. Figure 4.3 shows the symmetry of reponses to this question.

Figure 4.2

Opinions Regarding Impact of HVETL on Potential Building Sites

Diagram 1

% of Total Interviewed Who Feel the HVETL Does Affect Potential Building Sites

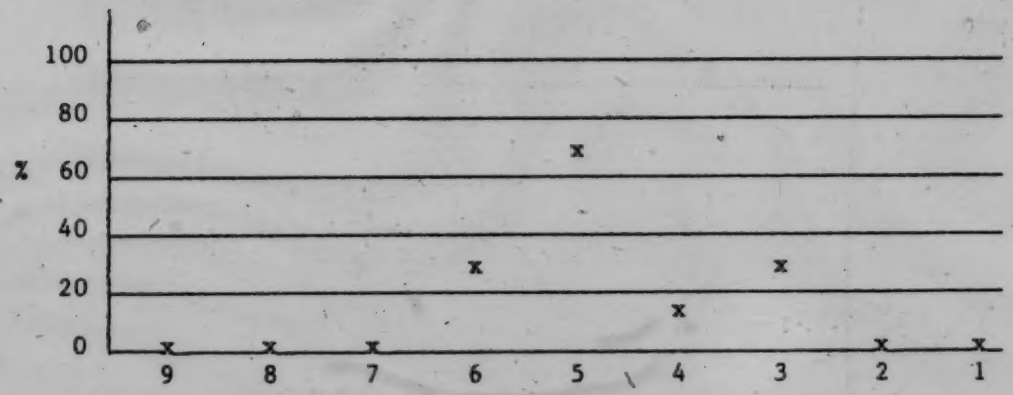


Diagram 2

% of Total Responses Who Feel the HVETL Does Affect Potential Building Sites

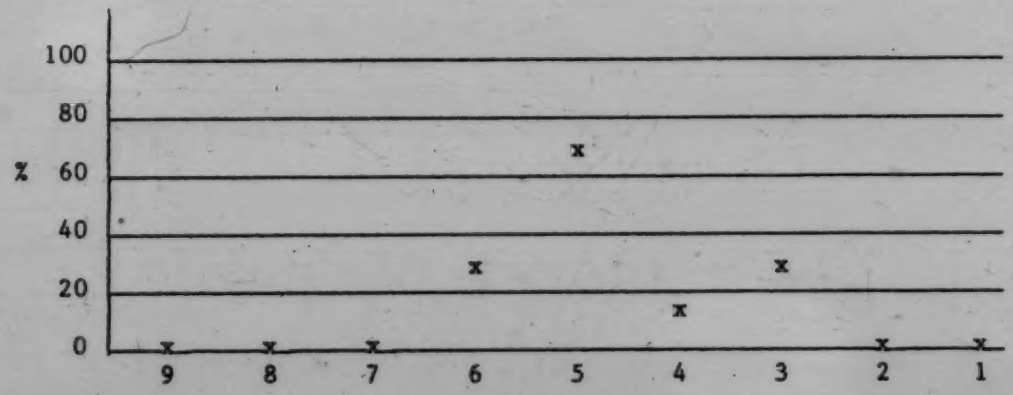


Figure 4.3

Impact of HVETL on Opinion of Aesthetic Value

Diagram 1

% of Total Interviewed Who Feel the HVETL Does Affect Aesthetic Value

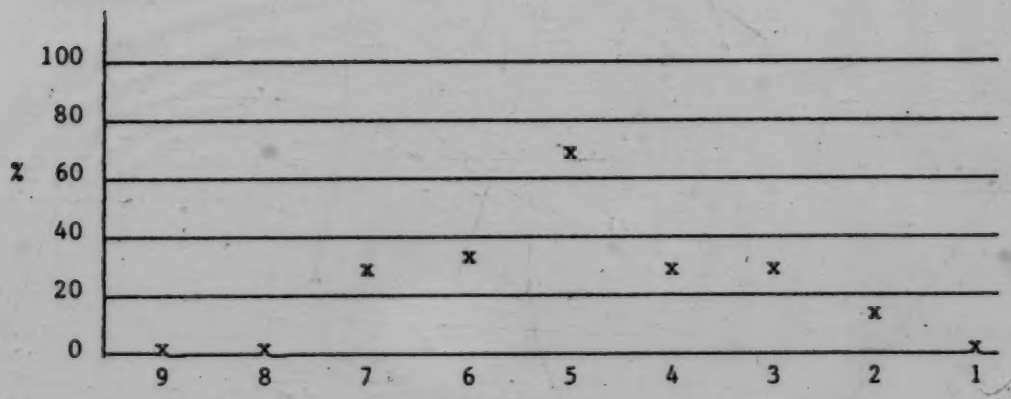


Diagram 2

% of Total Responses Who Feel the HVETL Does Affect Aesthetic Value

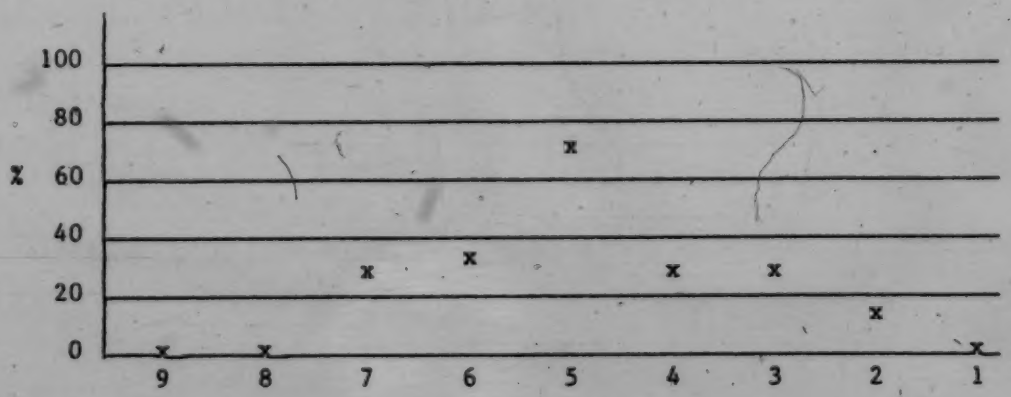


Figure 4.4 shows the results from the question, "Do you consider any personal danger caused by the power line?" The results show that landowners of properties encumbered by the HVETL feel personal danger more than landowners with unencumbered properties. Not all landowners of encumbered properties perceive personal danger. Some landowners two miles away from the HVETL perceive personal danger caused by the power line. This finding is unique in that some owners of parcel #9 (those parcels the furthest from the HVETL) perceive personal danger. In no other question did landowners of parcels #1 or #9 perceive a negative effect of the HVETL.

Results of the question, "Do you feel that fieldwork operations are affected by the presence of the power line?", are presented in Figure 4.5. 100% of landowners whose property is encumbered by the HVETL feel fieldwork operations are affected. Also, some owners of parcels #4 and #6 feel their operations may be affected. This concern pertains to aerial operations. All landowners answered this question and hence there is no Diagram 2 for Figure 4.5.

The results of questions which pertain to encumbered parcels only are shown in Table 4.18. Of the eight landowners interviewed, seven feel their property value is reduced. The percentage of reduction varies from 1 - 5% to 16 - 20% but averages approximately 10%. This value reduction pertains to the value of the quarter section.

Figure 4.4

Opinions Regarding Personal Danger Caused by the HVETL

Diagram 1

% of Total Interviewed Who Do Feel

Personal Danger Because of the HVETL

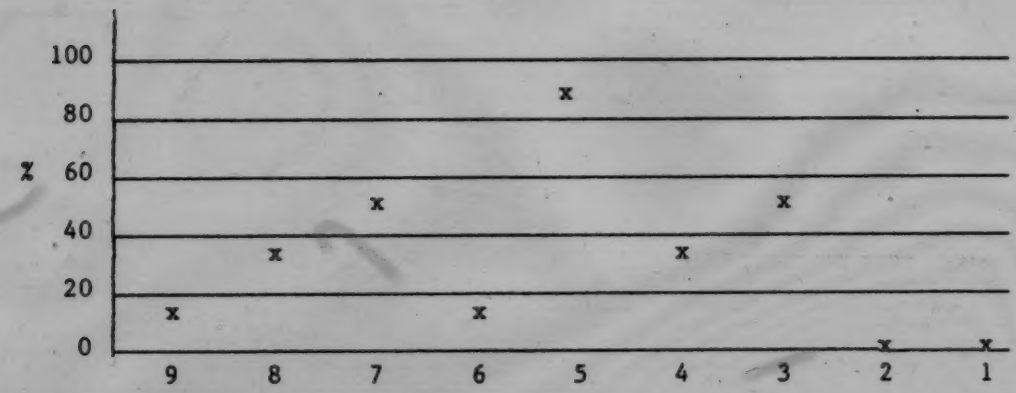


Diagram 2

% of Total Responses Who Do Feel

Personal Danger Because of the HVETL

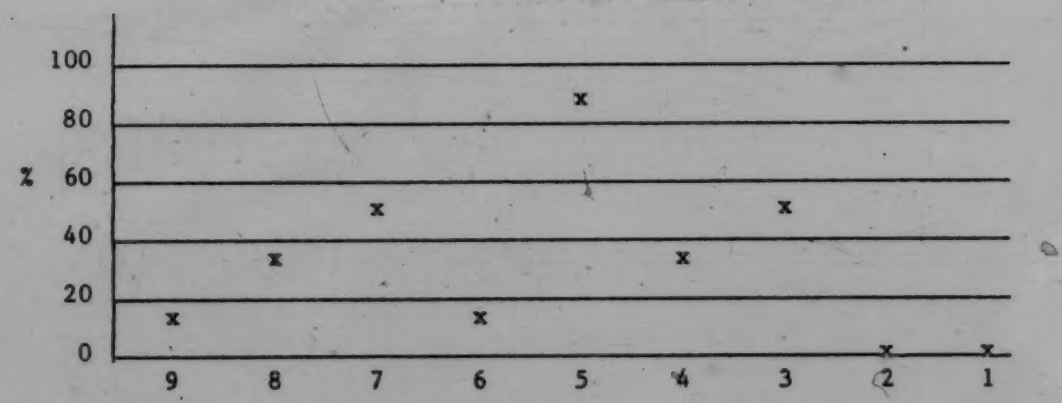


Figure 4.5

Opinions Regarding Impact of HVETL on Field Operations

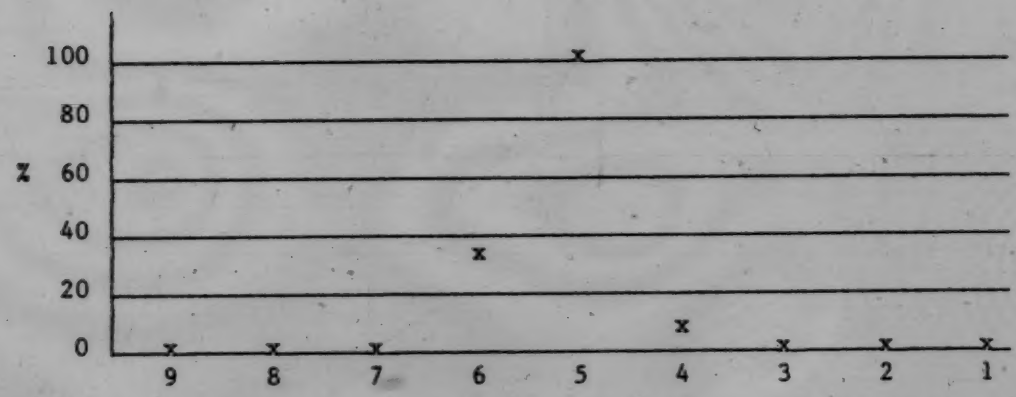


Table 4.18

Random Sample Results Regarding Opinions of Those Who Do Have an HVETL on the Quarter (parcel #5)

Line Segment	Random Sample Number	# Towers Per Quarter	Configuration	Effect Value	What %	Reason
High River	221	3	Parallel	Decrease	6-10%	Inconvenience
High River	248	2	Both	No Effect	0	
High River	671	2	Parallel	Decrease	6-10	Inconvenience
High River	707	2	Parallel	Decrease	16-20	Bldg./Inconvenience
High River	863	1	Diagonal	Decrease	1-5	
High River	911	3	Diagonal	Decrease	16-20	Use of Land
Airdrie	1166	6	Parallel	Decrease	6-10	Inconvenience
Airdrie	1724	4	Parallel	Decrease	6-10	Inconvenience

Comparison of Questionnaire Results

Table 4.19 compares opinions of sales participants (80 -170 acre size category) with opinions from those randomly selected (parcel #5). The responses are fairly consistent between these two data sources. Included in Appendix V are four tables which provide greater analysis of the opinions. A non-parametric test of hypothesis for two samples involving two proportions (Mason, 1978) is used to statistically analyze the results. The results are discussed briefly. There is no significant difference at the 10% level between the opinions of the sales participants and those landowners randomly selected. Twelve tests were completed to compare opinions of landowners from High River versus Airdrie. Of the 12 tests, there is no significant difference between High River and Airdrie in eleven of the analyses. The one analysis for which there is a significant difference relates to aesthetic value. Results of the random sample suggest that landowners on the High River segment feel their aesthetic value is decreased more than landowners on the Airdrie segment.

Comparison of the opinions of sales participants of the 80 - 170 acre size category with the 171 plus acre size category is also included in Appendix III. All landowners whose property is encumbered by the HVETL feel their fieldwork operations are impacted. Owners involved with an 80 - 170 acre size category transaction, in all other cases, feel the rights of the property are affected more than owners involved with a 171 plus acre size category transaction. However, only with the case of personal danger, is the difference significant at the 2% level.

Opinions regarding the impact of the HVETL on individual rights are compared in order to determine if landowners perceive the impact to be equal on all rights (which were addressed). Results indicate that the impact of the HVETL is not equal on all individual rights.

Table 4.20 compares the landowner's opinion of the impact of the HVETL on his property value with the One Best Comparable Value of Adjusted

Table 4.19

Comparison of Opinions From Sales Participants vs. Random Sample and From High River vs. Airdrie

	Percentage of Respondents Who Feel an Impact Because of the HVETL				
	Property Value	Asthetic Value	Personal Danger	Fieldwork Operations	Potential Building Sites
High River					
- Opin. - Sales*	77.8	75.0	77.8	100.0	-
- Opin. - Random Sample**	83.3	100.0	83.3	100.0	50.0
Airdrie					
- Opin. - Sales*	71.4	57.1	71.4	100.0	-
- Opin. - Random***	100.0	0.0	100.0	100.0	100.0

* 80 - 170 acre transactions.

** Parcel #5.

*** Two questionnaries represent this category and hence values of 0, 50 or 100 are the only possibilities.

Table 4.20

Comparison of Sales Participants' Opinion of Effect on Value with Comparable Sales Prices

Line Segment	Ref #	Effect Value	By What %	1981 Per Acre Sales Price	One Best Adj. Comparable
High River	34	Decr.	6-10%	1,254	1,302
High River	35	Decr.	6-10	-	-
High River	36	Decr.	11-15	710	965
High River	37	No Ans.	-	1,281	1,096
High River	38	Decr.	Subst.	940	942
High River	39	Decr.	Subst.	-	-
High River	40	Decr.	-	-	-
High River	41	No. Ans.	-	1,002	1,079
High River	42	No Change	0	1,006	1,035
High River	43	No. Ans.	-	1,108	1,112
High River	45	Decr.	-	1,142	1,233
High River	46	No Change	0	-	-
High River	47	Decr.	-	910	1,115
High River	48	Decr.	-	910	1,270
High River	49	No Change	0	1,100	1,328
High River	50	No Change	0	-	-
High River	80	Decr.	6-10	-	-
High River	81	No Change	0	-	-
Airdrie	1	Decr.	16-20	1,327	1,324
Airdrie	6	No Change	0	1,503	1,373
Airdrie	10	Decr.	-	547	634
Airdrie	14	Decr.	6-10	1,374	1,442
Airdrie	19	Decr.	-	1,431	1,569
Airdrie	24	Decr.	5	1,175	1,199
Airdrie	28	Decr.	16-20	1,222	1,296
Airdrie	32	No Change	0	-	-

Comparables. A good comparable was not found in all cases and hence, price comparison is not presented for those parcels.

Interpretation of Results

Results of this chapter clearly indicate that the market value of some encumbered agricultural properties are reduced because of an HVETL. This reduction in market value is attributable to an impact on landowners' property rights. Specifically, the impact of an HVETL on property which has potential for irrigation use appears significant. This impact on current value is not on current use which is dryland agriculture, but is on expected future use. Landowners recognize potential use of property. In order to reduce landowner discontent, compensation for impact of an HVETL should also recongize this potential. Until a mechanism of recognizing this real impact is instituted, discontent may persist.

Results from the two questionnaires suggest that HVETL impact varies with a) the individual landowner, b) land use and c) HVETL configuration. The impact also varies on different rights (i.e. not all rights are affected equally). All landowners of encumbered properties felt their fieldwork operations are affected. Between 60% and 80% of landowners surveyed feel their property value is decreased, the aesthetic value is reduced and feel personal danger because of the HVETL. Alternatively, between 20% and 40% of landowners surveyed feel these rights are not impacted. Not enough encumbered properties with residences near the HVETL were found to draw firm conclusions regarding this potential impact.

The study results suggest that each property may be impacted somewhat differently. Therefore, flexibility when considering both the method of estimating compensation and the amount of compensation is desired. Policy implications are presented in Chapter V of this study.

In conclusion, this study shows that in some circumstances, land value is reduced by the presence of an HVETL. In order to ease the discontent regarding surface rights issues between the energy and

agricultural industries, a method of compensation which acknowledges potential land use changes and is equitable to both parties, must be implemented.

V. POLICY CONSIDERATIONS

One aspect of the problem of landowner discontent has been examined. From investigating the impact of HVETL on agricultural land values, a potential cause of the discontent becomes evident. Compensation to landowners should not only consider losses from land uses in the current time period, but also losses from potential uses. Intangibles, such as impact on aesthetic value, may also be impacted and hence should be considered.

Results of this study show the impact of an HVETL on rights is real. This impact is on rights within the easement and can be on rights outside of the easement. In order to ease landowner discontent, impact on property rights, impact on land use and levels of compensation should be considered.

Impact on property rights outside of the easement appears to depend upon land use. For example, impact on strictly dryland agriculture is not as great as impact on property with irrigation potential. Impact on individual rights also appears to vary. For example, the impact on aesthetic value is greater along the High River segment than along the Airdrie segment. Logically, this makes sense and may be caused by the Rocky Mountains along the High River segment.

The methods of determining compensation and the amounts of compensation are also important to the discontent. Results of the questionnaires which deal with compensation are presented. Also, compensation policies of Ontario Hydro are reviewed so that other ingredients can be considered.

Questionnaire Results

Market Participant Opinions

The final results of the market participants' questionnaire concerns methods of determining levels of compensation. Of the 26 interviewed landowners who were involved in the sale of an encumbered property, five receive annual compensation, 18 do not and 3 did not respond to

the question. Results from the question, "If you had involvement in determining how compensation were to be paid, would you prefer lump sum, annual or both?", show that 15 (57.7%) prefer annual, 7 (26.9%) prefer a combination of lump sum and annual and 4 (15.4%) did not respond to the question.

When asked how much an annual compensation should be, 20 (76.9%) did not suggest an amount. The other 6 feel that annual compensation should range from $40.00 to $200.00 per tower per year. The most frequent answer is $100.00 per tower per year. Table 5.1 presents these results.

The next question asked was, "Hypothetically, if you could pay to have the power line removed, how much would you pay in lump sum or annually?". The amounts are shown in Table 5.2. These amounts are per parcel involved in the transaction and so most involve more than one tower. Of the landowners who answered the amount of lump sum payment, 7 would not pay to relocate the HVETL while 7 would pay an amount. The amounts ranged from $100.00 to $20,000.00. Only 1 landowner would pay an annual amount.

Random Sample Opinions

Of the 8 landowners with HVETL across their property, 4 received annual compensation and 4 did not. All 4 who received compensation felt the level was too low and should, on an annual per tower basis, range from $50.00 to $1,000.00 (1 felt $50.00, 1 - $70.00, 1 - $500.00 and 1 - $1,000.00). Regarding the question of how compensation should be paid, of the 8 interviewed, 2 had no opinion, 1 felt compensation should be a combination of lump sum and annually and 5 felt compensation should be annual only.

Responses to the question of whether the landowner would contribute financially to relocation of HVETL reveal that most would not contribute (Table 5.3). This response was expected because the question was asked, not only to landowners with encumbered properties, but also to landowners of properties up to two miles from the HVETL. Table 5.4

Table 5.1

Opinions Regarding Amount of Annual Compensation to be Paid for an HVETL

Number of Respondents	Amount Per Tower
1	40.00
1	75.00
3	100.00
1	200.00
20	No Answer

Table 5.2

Opinions Regarding the Amount Landowners Would Pay to Relocate the HVETL

Lump Sum

n	Amount Per Parcel
7	0
1	100.00
1	600.00
1	2,000.00
1	5,000.00
1	7,500.00
1	15,000.00
1	20,000.00
12	No Answer

Annually

15	0
1	500.00
10	No Answer

Table 5.3

Landowners Who Would Contribute Financially to Relocate the HVETL

	%	n
Yes	18.8	13
No	71.0	49
No Answer	10.1	7
	100.0	69

Table 5.4

Amount of Landowner Contribution to Relocate the HVETL

n	Amount
Lump Sum	
1	100.00
4	1,000.00
1	10,000.00
Annually	
1	20.00
3	100.00
1	200.00
1	500.00

shows the amount of contribution. The amounts are per quarter section.

Results from the questionnaires do show that landowners appear to have a preference to receive annual compensation. However, of those who would pay to relocate the HVETL, most would prefer to pay lump sum. Because of ongoing problems and impacts caused by the line, the choice of receiving annual compensation appears logical. The proportion of landowners who are willing to pay to relocate the HVETL and the amounts which they are willing to pay, confirms that HVETL do have real impacts to some landowners.

Ontario Hydro Compensation Policies

Compensation Policies of Ontario Hydro are reviewed in order to suggest alternative methods of dealing with compensation. Included in the Appendix is a quotation taken from the pamphlet, Property and Compensation Policies (Ontario Hydro, 1980). A summary of features from the pamphlet are presented.

A number of options and apparent flexibility are features of Ontario Hydro's compensation policy. These flexible policies for the acquisition of property rights were approved by the Board of Directors of Ontario Hydro in 1974, 1976 and 1977 (Ontario Hydro, 1980a).

- Firstly, under certain high impact circumstances, both owner and Ontario Hydro may agree that Hydro buy the entire property. This may be the case where an owner's residence is involved.
- Secondly, in most instances, landowners are given the choice of Ontario Hydro acquiring full ownership or an easement in perpetuity on the required area.
- In most cases when Ontario Hydro acquires full ownership of the required area, the landowner can lease back the area for $1.00 per hectare per year plus taxes.
- When an easement is acquired, the owner can choose an annual payment instead of a lump sum. The annual payment is

periodically reviewed to reflect current land values and interest rates.

- When an easement is acquired, compensation is based upon 75% of the market value of land plus an amount per tower plus an allowance for injurious affection.
- A separate discussion relating to injurious affection is included. The amount recognizes individual and exceptional circumstances. The implication of having a separate discussion of injurious affection is to ensure it is fully considered.

To summarize the main features of Ontario Hydro's system include landowner choice regarding how compensation is paid (lump sum or annual) and separate consideration of injurious affection caused by the power line.

Recommendations

Several policy recommendations flow from the results of this study. These recommendations are not all inclusive but do represent some suggestions which may help reduce landowner discontent regarding surface rights issues. The first recommendation deals with planning. Thorough consideration of HVETL impact during the planning stage may reduce the need for emphasis in the compensation stage.

1) The value of property which has irrigation potential appears to be reduced by an HVETL crossing the property. Of the properties studied which have irrigation potential, the HVETL either crosses them diagonally or parallel but not on the property boundary. The influence of an HVETL along the property boundary is expected to be less than an HVETL which diagonally crosses a property.

   When possible, HVETL's should not be constructed in areas which are irrigated or which have irrigation potential.

   Constructing an HVETL on the quarter section boundary may reduce the impact because quarter section pivots may be used on each

quarter. However, this general statement is not true in all circumstances. For example, a coulee across one quarter may require the pivot to be centered between quarters. Also, pivot irrigation systems which irrigate a full section are increasing in popularity. An HVETL constructed on the quarter section boundary eliminates use of a pivot which irrigates a full section.

In order to reduce conflict because of the land use issues, the Energy Resources Conservation Board should have agricultural expertise in order to assess reports and claims regarding agricultural land use. A step in this direction has recently been taken by the ERCB when an agrologist was hired. However, only the first step has been taken.

2) The impact of an HVETL on individual rights of a property vary. For instance, the impact on fieldwork operations is different than the impact on aesthetic value. Therefore, impact of an HVETL is not constant but varies depending upon the importance of each right or property characteristics. This variance in importance of rights changes with changes in land use. Compensation policies should acknowledge this difference between the potential uses of various properties. The Energy Resources Conservation Board, because they decide on route selection, should emphasize planning aspects of HVETL in order to minimize conflicts.

3) Most landowners have a preference of receiving annual compensation as opposed to lump sum amounts. This preference is recognized by Ontario Hydro where the landowner has options as to the methods by which he will receive compensation. In theory, a lump sum payment or an annual payment may equate to the same amount. The discount rate is, however, an important issue.

Because of differences in landowners' preferences and values, a compensation policy which allows for landowner choice may help in reducing landowner discontent.

4) Annual Compensation should be paid when annual costs are created. Annual payment for loss of use and adverse effect should be paid to the landowner who is affected. Annual payments should not be reserved by the vendor when a property is sold. Trans Alta Utilities has very recently announced that landowners of properties encumbered by HVETL will be paid annual compensation. This policy announcement should help reduce discontent.

An inequity may arise if a property sold at a reduced value because the purchaser did not expect annual payments and then the purchaser did, in fact, receive annual payments. In this instance, the vendor will suffer the disadvantage.

5) Opinions of market participants regarding the level of annual compensation ranged from $40.00 to $200.00 per tower depending on land use and HVETL placement. Opinions of those randomly selected ranged from $50.00 to $1,000.00 per tower. Comparison of the levels of compensation believed equitable and the willingness to pay to relocate the HVETL illustrates that one landowner would contribute up to $20,000.00 while other landowners would not contribute to relocate the HVETL.

An implication is that a) personal values, b) land use and c) HVETL placement are all significant variables when considering impact of an HVETL.

6) When a possible impact of an HVETL exists, the landowner appears to want compensation in the event the possibility materializes. The company may not want to pay compensation in case the possibility does not materialize. When compensation payments are lump sum only or when they do not acknowledge possible changes, a conflict is created. In most instances, neither party is unreasonable but both want equitable treatment.

A clause in some recent pipeline easements in Alberta states that if, in the future, the property is drained and, because of the

pipeline, the cost of laying drainage pipe, etc. is higher, the pipeline company will pay the amount of increased cost. A clause such as this protects both the Company and the landowner.

Based upon the real impacts which can be caused by an HVETL, the inclusion of such a clause would guarantee the landowner that he will not suffer future damages. Landowner concern, as in the example of property with irrigation potential, is real and may be a cause of the discontent.

These policy recommendations are suggested to help ease landowner discontent regarding surface rights issues.

VI. SUMMARY AND CONCLUSIONS

Conflict between the agricultural and energy industries regarding surface rights issues has increased in the late 1970's and early 1980's. This growing concern has led to landowner discontent regarding legislation concerning property rights, land use and compensation. Many landowners feel their property rights are being eroded, their land is taken out of agricultural production and compensation to them is not adequate. Among government actions taken to reduce discontent was the establishment of a Select Committee by the Alberta legislature to address the problem of surface rights. The Select Committee presented a Report in November, 1981. Changes to the current legislation are expected during the fall, 1982 or spring, 1983, sittings of the Alberta legislature.

The magnitude and complexity of the institutional process of a rights issue is evident. The Energy Resources Conservation Board and the Surface Rights Board are two of the most visible Boards which play a role in distribution of and compensation for rights. These Boards not only react to legislation but also to public submissions, court rulings and other institutional forces. As discussed in this thesis, legal, political, social and economic thoughts are interwoven and may all have a role in finding ways to reduce landowner discontent. Easing of the conflict will not come quickly nor are there any simple solutions to such a complex problem.

The purpose of this thesis is to examine one particular area of landowner concern in hope of shedding light on the more general problem of landowner discontent. The primary purpose of this research is to determine if HVETL's reduce the values of agricultural property in southern Alberta. In order to meet this purpose, primary data from agricultural producers were collected. These data included approximately 75 confirmed "arm's-length" sales of property which are encumbered by or in close proximity to an HVETL. In addition, two separate sets of questionnaires were completed. The first questionnaire deals with opinions of approximately 25 landowners involved with

the sale of a property encumbered by an HVETL. The second questionnaire analyzes the opinions of approximately 70 randomly selected landowners who either own encumbered property or property within two miles of an HVETL. The analysis of this data suggests that landowners do have real concerns and changes which address these concerns may be necessary to ease conflict.

Results of this study show that HVETL may, depending upon specific circumstances, reduce the value of agricultural property. The most significant reduction in property value is observed on those properties which have irrigation potential. Although other variables, such as whether one or two HVETL encumber the property, are important, irrigation potential appears to be the most important variable which has been identified. This incompatibility between HVETL and property with irrigation potential is important to recognize.

Alberta accounts for over 50% of the irrigated farmland in Canada. Some 537,321 acres in Alberta were reported irrigated in 1970. This figure rose in 1981 to 1,037,173 acres under irrigation assessment roll within the irrigation districts and 401,319 acres licenced for irrigation outside the districts for a total of 1,438,492 acres in the province (Karkanis, 1982a).

The increase in irrigation may not have reached its full potential. The following table is from Karkanis (1982b).

Table 6.1

Irrigable, Assessed for Irrigation and Suitable Land for Irrigation in Southern Alberta

Land	Within Districts	Outside Districts	Total
Irrigable	2,500,000	10,600,000	13,100,000
Assessed For Irrigation	1,037,200	401,300	1,438,500
Suitable For Future Dev.	1,462,800	10,198,700	11,661,500

Of the total irrigable area in southern Alberta, only 11% is currently assessed for irrigation. Therefore, depending on economic constraints, property which is currently dryland but which has potential for irrigation and is encumbered by an HVETL, may, if and when the irrigation potential is probable, be injuriously affected by the HVETL. It is important to realize that the irrigation potential exists today, to varying degrees, in parts of southern Alberta. The magnitude of impact varies with each property's unique characteristics including expected time until the property is irrigated. This time may be five years, or in other cases, the irrigation potential may not materialize. The cost of water delivery systems, charge to water users and value of marginal product from irrigation are important variables which change over time. Therefore, although another 11,661,500 acres are currently considered to be suitable for future irrigation development, these acreages and their development hinge upon institutional and economic constraints.

Other study results show that the value of encumbered properties which are used for dryland agricultural and which are expected to continue in that use are not reduced. This is especially the case when annual compensation is paid to landowners for loss of use and adverse effect.

Not enough encumbered properties with residences near the HVETL were found to draw firm conclusions regarding this potential impact. However, potential impact appears to depend on personal tastes and values.

Results from the two questionnaires suggest that impact on rights varies with individual landowner perceptions, specific land uses and HVETL configurations. Given similar land use and HVETL configuration, opinions regarding the HVETL varied considerably between individual landowners. Also, impact on specific rights varies. For example, impact on field operations was suggested by all landowners of encumbered properties. However, 60 to 80% of surveyed landowners feel their aesthetic value is impacted because of the HVETL.

A significantly higher proportion of landowners with a view of the Rocky Mountains as compared to no mountain view, feel their aesthetic value is impacted. The questionnaire results tend to support and explain results from analysis of sale prices. Based upon study results, potential land use changes may cause real impacts and should be considered. Intangibles, such as impact on aesthetic view, may also be impacted by an HVETL. Another study finding suggests that landowners involved with an 80 to 170 acre sale perceive more personal danger than those landowners involved with a 171 plus acre sale (see Appendix V.3).

Study results suggest that impact of an HVETL may vary depending upon individual circumstances. Therefore, flexibility when planning routes and when considering the method of estimating compensation and the amount of compensation is required. Chapter V considers policy implications. An obvious recommendation is to include more agricultural input into the planning of surface obstructions. Agrologists should be included in ERCB hearings either as Board members or as Board advisors. The intent is to reduce land use and potential land use conflict.

Ontario Hydro's compensation policies were reviewed and several of their attributes are suggested as measures to reduce conflict. Landowners prefer to have a choice of either lump sum or annual payments. Annual payments reflect changing land prices and hence, to some degree, land use. An attribute which is not contained in Ontario Hydro's policy, but which is contained in some Alberta easements, states that future increased marginal cost relating to land drainage, which is created by the pipeline, will be paid by the Company. A clause such as this protects energy companies from compensating landowners for potential problems which may not materialize while also protecting landowners.

A recommendation of this study which has not yet been discussed relates to costs of a large study. Landowners are assured of recovering reasonable legal and appraisal fees incurred to ensure fair

compensation. These reasonable fees may not be adequate to investigate, in sufficient detail, a problem such as injurious affection caused by an HVETL. Energy companies, because of their size, may be in a preferred position to fund large studies which address general issues. A recommendation of this study is that funding be available, either through the ERCB, SRB or Department of Agriculture which will allow investigation of these general issues. There can be little doubt that further research and policy changes are required in order to cool the discontent.

Steps to alleviate the problem have been taken. These steps not only include the expected legislative changes, but also the recent Trans Alta Utilities Ltd. announcement that annual compensation will be paid on all HVETL. This new policy indicates a willingness to change in an attempt to resolve the problem. Hopefully, this study may also be useful in reducing conflict.

Results of this study pertain to the opinions and values, not only of property but also human, in the late 1970's and early 1980's in southern Alberta. Results in other societies or parts of North America or in southern Alberta, when the next generation is farming, may differ. As Libby (1974, p. 1,143) said, "In some sense, land use patterns are a physical template of all the pressures inherent in location of people and things in modern society. Debate is focused on land but reflects more basic human motivations and values - stability, privacy, freedom, and income."

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APPENDIX I

SALE PARTICIPANT QUESTIONNAIRE

High River 1_____
Red Deer 2_____
Cal-Leth 3_____
Taber 4_____

* Comparable #_____
Subject #_____

A. General

* 1. Legal Description:_____

* 2. Name of Seller:_____

* 3. Name of Buyer:_____

* 4. Interviewed: Buyer ___ ; Seller ___ ;
Other: Specify _____

* 5. "Arm's-Length" Sale: Yes ___ No ___

* 6. Date of Sale: Year_____ Month_____

B. Area Characteristics

* 1. Distance to Paved Road: Miles_____ km_____

* 2. Distance to Gravel Road: Miles_____ km_____

* 3. Distance to Nearest Town: (elevator) Miles_____ km_____

* 4. Population of Nearest Town: Number_____

* 5. Distance to Nearest City: (> 250,000 population) Miles_____ km_____

C. Real Property Characteristics

* 1. Parcel Size: Acres_____

* 2. Cropland: Acres_____ ; %_____

* 3. Native Pasture or Bush Acres_____ ; %____

* 4. a) C.L.I. (Ag.)_____

* 4. b) C.L.I. (Rec.)_____

* 5. Assessment R-factor:_____

* 6. Building Value:_____

* 7. Sale Price:_____

* 8. Railway Severance: Yes ___ No ___

* 9. Petroleum Wellsite: Yes ___ No ___

*10. Pipeline: Yes ___ No ___

*11. Road Severance: Yes ___ No ___

*12. Water Rights - Permanent: Acres_____; %____; 1st - 4th____

Temporary: Acres_____; %____

Total : Acres_____; %____

*13. Acres Irrigated: Acres_____

*14. Type of Irrigation System:

Pivot ____ ; Wheel Roll ____ ; Hand Move ____ ; Flood ____ ;

Other (specify): _____

D. Power Line Characteristics

* 1. Does (is) the power line: cross ___ ; in sight ___ ;

out of sight ___

2. Does the property have a service power line?

Yes ___ No ___

3. Distance to power line: Miles_____ km_____

4. Number of towers on property: _____

5. Number of lines across property: _____

6. Line configuration: Parallel ___ ; Diagonal ___ ; Both ___ ; N/A ___

Sketch:

7. Approximate length and width of R/W:

Length_____ Width_____ N/A ___

8. % of line on cultivated land: %_____ ; acres_____ ; N/A ___

E. Landowner Opinions

* 1. a) What is your estimated value of the property today?

$_____

b) Does the power line affect your estimate of the property value?

No Change ___ ; Increase ___ ; Decrease ___ ; No Answer ___

c) By what percent?

0 - 5% _____
6 - 10% _____
11 - 15% _____
16 - 20% _____
Other _____

d) What is this opinion based upon?

* 2. How close are your nearest buildings to the power line?

_____ft.

Do you feel your buildings are affected? Yes ___ No ___
If yes, how?

* 3. Do you feel the aesthetic value is affected? Yes ___ No ___
If yes, how?

* 4. Do you consider any personal danger caused by the power line?

Yes ___ No ___

If yes, what is the nature of the perceived danger?

* 5. Hypothetically, if you could pay to have the power line removed, how much would you pay?

Lump sum $_____

Annually $_____

	Yes	No
6. Is this the first power line you have been involved with?	___	___
Was there a power line at date of transaction?	___	___
Did the power line affect the transaction in any way?	___	___

If yes, how?

Was there a price difference in the transaction?	___	___

If yes, how much? _____%

If you were involved in a transaction which involved a power line again, would the power line affect the transaction (purchase or sale price)?	___	___

If yes, how much?

7. Do you receive annual compensation? Yes ___ No ___ N/A ___

If you had involvement in determining how compensation were to be paid, which would you prefer?

Lump sum ___ Annual ___ Both ___

How much annual compensation? $_____

Comments:

8. Do you feel fieldwork operations are affected by the presence of the power line?

Yes ___ No ___ N/A ___

If yes, how?

___ Fieldwork
___ Aerial Operations or Potential
___ Irrigation or Potential
___ Weed Control
Other:

9. Do you prefer to:

a) control weeds and receive compensation?
b) not to be involved with weed control?

N/A ___

Other Opinions:

APPENDIX II

RANDOM SAMPLE QUESTIONNAIRE

* High River 1_____
* Red Deer 2_____

* On Line - Sale _____
* - No Sale _____
* Off Line - Sale _____
* - No Sale _____

A. General

* 1. Legal Description of Quarter:_____

* 2. Name of Owner:_____

3. Does Owner Farm? Yes ___ ; No ___

If No, Name of Lessee_____

4. Interviewed: Owner ___ ; Lessee ___

Other: Specify_____

5. If Property Sold, was it an "arm's-length" sale? Yes __ ; No __

6. Date of Sale: Year _____ ; Month _____

7. Sale Price:_____

Any special circumstances?_____

B. Area Characteristics

* 1. Distance to Paved Road: Miles_____ ; km_____

* 2. Distance to Gravel Road: Miles_____ ; km_____

* 3. Distance to Nearest Town: Miles_____ ; km_____
(town with elevator)

* 4. Population of this Town: # People_____

* 5. Distance to Nearest City: Miles_____ ; km_____
(Population at least 250,000)

C. Real Property Characteristics

* 1. Acres in Quarter:_____

2. Acres in Cropland:_____

3. Acres of Native Pasture or Bush:_____

* 4. a) C.L.I. (Ag) _____

* b) C.L.I. (Rec) _____

5. Assessment R factor:_____

6. Building Value:_____

7. Does the Property have a service power line? Yes ___ ; No ___

* 8. Railway Severance: Yes ___ ; No ___

* 9. Petroleum Wellsite: Yes ___ ; No ___

*10. Pipeline: Yes ___ ; No ___

*11. Road Severance: Yes ___ ; No ___

*12. Water Rights - Permanent: Acres_____; %_____; 1st - 4th___

Temporary: Acres_____; %_____

Total : Acres_____; %_____

*13. Acres Irrigated: Acres_____

*14. Type of Irrigation system:

Pivot ____ ; Wheel Roll ____ ; Hand Move ____ ; Flood ____ ;

Other (specify): _____

D. Power Line Characteristics

1. Is the power line: on the property ___ ; in sight ___ ; out of sight ___

* 2. If in sight or out of sight, distance from the quarter to the power line? miles_____ ; km_____

3. If the power line is on the property:

a) # of towers on the quarter? _____

b) line configuration: Parallel ___ ; Diagonal ___ ; Both ___

c) approximate length and width of R/W: Length_____ Width_____

d) approximate area in R/W: _____acres

e) % of line on cultivated land: %_____; acres_____

* 4. The number of HVETL either <u>on</u> or <u>in sight</u> of the property:

One_____ ; Two_____ ; Three_____

E. <u>Landowner Opinions</u>

1. a) What is your estimated value of the quarter today? $_____

b) <u>Does</u> the power line affect your estimate of the property value?

No Change ___ ; Increase ___ ; Decrease ___ ; No Answer ___

c) Change by what % (check one)?
1 - 5% _____
6 - 10% _____
11 - 15% _____
16 - 20% _____
Other _____

d) What is this opinion based upon?

2. a) If a landowner group were formed and their objective were to relocate the HVETL away from this area, would you contribute financially to the relocation?

Yes ___ ; No ___

b) If yes, how much? $_____ lump sum
$_____ annually

3. a) Do you receive annual compensation from Calgary Power?

Yes ___ ; No ___ ; Line Not on Property ___

b) Is current compensation adequate?

Yes ___ ; No ___ ; No Opinion ___

c) How much compensation do you feel is adequate?

$_____ lump sum
$_____ annually

d) Do you feel compensation should be:

i) lump sum only ___

ii) annual only ___

iii) a combination of lump sum and annual ___

iv) no compensation should be paid ___

v) no opinion ___

4. a) How close are your nearest buildings to the HVETL?

_____ feet ; _____ mile(s)

b) Do you feel these buildings are affected?

Yes ___ ; No ___ ; No Answer ___ ; Not Applicable ___

c) If yes, how?

d) Do you feel the HVETL affects potential building sites on the subject quarter?

Yes ___ ; No ___ ; No Answer ___

5. a) Do you feel the aesthetic value of the quarter is affected?

Yes ___ ; No ___ ; No Answer ___

b) If yes, how?

6. a) Do you consider any personal danger caused by the power line?

Yes ___ ; No ___ ; No Answer ___

b) If yes, what is the nature of the perceived danger?

7. a) Do you feel that fieldwork operations are affected by the presence of the power line?

   Yes ___ ; No ___ ; No Answer ___

   b) If yes, which operations and how?

   - fieldwork (cultural)_____

   - aerial operations or potential_____

   - irrigation or potential_____

   - weed control_____

   - other_____

8. Other Opinions

APPENDIX III

Table III.1
Opinions of Market Participants

Did the power line affect the transaction in any way?

% of Responses

Size (acres)	High River			Airdrie			Total		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
	- percent -			- percent -			- percent -		
80 - 170	30	60	10	28.6	71.4	0	29.4	64.7	5.9
171 - 400	0	66.7	33.3	100	0	0	25	50	25
401 - 650	0	66.7	33.3	0	0	0	0	66.7	33.3
651 +	0	50	50	0	0	0	0	50	50
All Sizes	16.7	61.1	22.2	37.5	62.5	0	23.1	61.5	15.4

Table III.2
Opinions of Market Participants

Was there a price difference in the transaction?

% of Responses

Size (acres)	High River			Airdrie			Total		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
	- percent -			- percent -			- percent -		
80 - 170	10	60	30	28.6	57.1	14.3	17.6	58.8	23.5
171 - 400	0	66.7	33.3	100	0	0	25	50	25
401 - 650	0	66.7	33.3	0	0	0	0	66.7	33.3
651 +	0	50	50	0	0	0	0	50	50
All Sizes	5.6	61.1	33.3	37.5	50	12.5	15.4	57.7	26.9

Table III.3

Opinions of Market Participants

If you were involved in a transaction which involved a power line again, would the power line effect the transaction (purchase or sale price)?

% of Responses

Size (acres)	High River			Airdrie			Total		
	Yes	No	NA	Yes	No	NA	Yes	No	NA
	- percent -			- percent -			- percent -		
80 - 170	70	10	20	85.7	14.3	0	76.5	11.8	11.8
171 - 400	33.3	33.3	33.3	100	0	0	50	25	25
401 - 650	66.7	0	33.3	0	0	0	66.7	0	33.3
651 +	0	50	50	0	0	0	0	50	50
All Sizes	55.6	16.7	27.8	87.5	12.5	0	65.4	15.4	19.2

APPENDIX IV

Table IV.1
Random Sample Results

Does the power line affect your estimate of the property value?

% of Responses

Parcel		High River			Airdrie			Total		
		No Ch.	Decr.	NA	No Ch.	Decr.	NA	No Ch.	Decr.	NA
		- percent -			- percent -			- percent -		
East	1	100	0	0	66.7	0	33.3	90	0	10
	2	75	0	25	100	0	0	83.3	0	16.7
	3	100	0	0	100	0	0	100	0	0
	4	100	0	0	42.9	57.1	0	66.7	33.3	0
	5*	16.7	83.3	0	0	100	0	12.5	87.5	0
	6	33.3	33.3	33.3	66.7	33.3	0	44.4	33.3	22.2
	7	100	0	0	100	0	0	100	0	0
	8	100	0	0	100	0	0	100	0	0
West	9	100	0	0	100	0	0	100	0	0

Table IV.2

Random Sample Results

Do you feel the HVETL affects potential building sites on the subject quarter?

% of Responses

Parcel		High River			Airdrie			Total		
		Yes	No	NA	Yes	No	NA	Yes	No	NA
		- percent -			- percent -			- percent -		
East	1	0	85.7	14.3	0	100	0	0	90	10
	2	0	100	0	0	100	0	0	100	0
	3	0	100	0	33.3	66.7	0	25	75	0
	4	0	100	0	28.6	57.1	14.3	16.7	75	8.3
	5*	50	50	0	100	0	0	62.5	37.5	0
	6	33.3	50	16.7	0	100	0	22.2	66.7	11.1
	7	0	100	0	0	100	0	0	100	0
	8	0	100	0	0	100	0	0	100	0
West	9	0	100	0	0	100	0	0	100	0

Table IV.3

Random Sample Results

Do you feel the aesthetic value of the quarter is affected?

% of Responses

	V28	High River			Airdrie			Total		
		Yes	No	NA	Yes	No	NA	Yes	No	NA
		- percent -			- percent -			- percent -		
East	1	0	100	0	0	100	0	0	100	0
	2	0	100	0	50	50	0	16.7	83.3	0
	3	0	100	0	33.3	66.7	0	25	75	0
	4	0	80	20	42.9	57.1	0	25	66.7	8.3
	5*	83.3	0	16.7	0	100	0	62.5	25	12.5
	6	50	33.3	16.7	0	100	0	33.3	55.6	11.1
	7	0	100	0	33.3	66.7	0	25	75	0
	8	0	100	0	0	100	0	0	100	0
West	9	0	100	0	0	100	0	0	100	0

Table IV.4

Random Sample Results

Do you consider any personal danger caused by the power line?

% of Responses

Parcel		High River			Airdrie			Total		
		Yes	No	NA	Yes	No	NA	Yes	No	NA
		- percent -			- percent -			- percent -		
East	1	0	100	0	0	100	0	0	100	0
	2	0	100	0	0	100	0	0	100	0
	3	100	0	0	33.3	66.7	0	50	50	0
	4	40	60	0	28.6	71.4	0	33.3	66.7	0
	5*	83.3	16.7	0	100	0	0	87.5	12.5	0
	6	16.7	66.7	16.7	0	100	0	11.1	77.8	11.1
	7	100	0	0	33.3	66.7	0	50	50	0
	8	33.3	66.7	0	33.3	66.7	0	33.3	66.7	0
West	9	0	100	0	20	80	0	14.3	85.7	0

Table IV.5

Random Sample Results

Do you feel that fieldwork operations are affected by the presence of the power line?

% of Responses

Parcel		High River			Airdrie			Total		
		Yes	No	NA	Yes	No	NA	Yes	No	NA
		- percent -			- percent -			- percent -		
East	1	0	100	0	0	100	0	0	100	0
	2	0	100	0	0	100	0	0	100	0
	3	0	100	0	0	100	0	0	100	0
	4	20	80	0	0	100	0	8.3	91.7	0
	5*	100	0	0	100	0	0	100	0	0
	6	50	50	0	0	100	0	33.3	66.7	0
	7	0	100	0	0	100	0	0	100	0
	8	0	100	0	0	100	0	0	100	0
West	9	0	100	0	0	100	0	0	100	0

APPENDIX V

Table V.1

Comparison Of Opinions Between Sales Participants and Those Randomly Selected

Impact of HVETL on Rights

	Sales Participants*		Random Sample**		Degrees of Freedom	Calculated t Statistic
	Decrease	No Ch.	Decrease	No Ch.		
Value of Property	12	4	7	1	22	-0.71
Aesthetic Value	10	5	5	2	20	-0.19
Personal Danger	12	4	7	1	22	-0.71
Fieldwork	17	0	8	0	23	0

* Size of Parcel is 80 to 170 acres

** Parcel #5

Table V.2

Comparison of Opinions Between Landowners at High River vs. Airdrie

Impact of HVETL on Rights

	High River		Airdrie		Degrees of Freedom	Calculated t Statistic
	Decrease	No Ch.	Decrease	No Ch.		
Value of Property						
- Sales[1]	7	2	5	2	14	+0.32
- Random Sample[2]	5	1	2	0	6	-0.62
Aesthetic Value						
- Sales	6	2	4	3	13	+0.74
- Random Sample	5	0	0	2	5	+2.65**
Personal Danger						
- Sales	7	2	5	2	14	+0.32
- Random Sample	5	1	2	0	6	-0.62
Fieldwork						
- Sales	10	0	7	0	15	0
- Random Sample	6	0	2	0	6	0
Potential Building Sites						
- Random Sample	3	3	2	0	6	-1.26
Sales						
- Did HVETL affect the transaction	3	6	2	5	14	+0.20
- Was there a price difference	1	6	2	4	11	-0.81
- Next time, would the HVETL affect	7	1	6	1	13	+0.10

1 Size of parcel is 80 to 170 acres
2 Parcel #5
** Significant at the 5% level

Table V.3

Opinions of Sales Participants Varying With Parcel Size Category

Impact of HVETL on Rights

	Size Category 80 to 170 acres		Size Categories 171 acres plus		Degrees of Freedom	Calculated t Statistic
	Decrease	No Ch.	Decrease	No Ch.		
Value of Property	12	4	4	4	22	+1.23
Aesthetic Value	10	5	3	4	20	+1.07
Personal Danger	12	4	1	6	21	+2.72*
Fieldwork	17	0	6	0	21	0
Did the HVETL affect the transaction	5	11	1	5	20	+0.69
Next time would the HVETL affect the transaction	13	2	4	2	19	+1.06

* significant at the 2% level

Table V.4

Impact of HVETL on Rights[1]

	Degrees of Freedom	Calculated t Statistic
Sales Participants[1]		
Aesthetic Value and Personal Danger	29	-0.49
Aesthetic Value and Fieldwork	30	-2.54***
Personal Danger and Fieldwork	31	-2.21**
Random Sample[2]		
Aesthetic Value and Personal Danger	13	-0.78
Aesthetic Value and Fieldwork	13	-1.64
Personal Danger and Fieldwork	14	-1.03
Potential Bldg. Sites and Aesthetic Value	13	-0.37
Potential Bldg. Sites and Personal Danger	14	-1.15
Potential Bldg. Sites and Fieldwork	14	-1.92*

1 Parcel size - 80 to 170 acres
2 Parcel #5
* significant at the 10%
** significant at the 5%
*** significant at the 2%

1 This table compares the perceived impact of the HVETL on various rights in order to determine whether landowners believe various rights on the same parcel are impacted equally or differently by the HVETL. For example, considering the sales participants, the impact on aesthetic value is not considered equal to the impact on fieldwork.

APPENDIX VI

Exerpt from Ontario Hydro, 1980a

"Compensation

The basis of compensation in Ontario for expropriation of land rights is determined by The Expropriations Act, which stipulates that no owner should be put in a position of financial loss as a result of action taken by any expropriating authority.

Easement

In the case of agricultural lands, the compensation formula recognizes the market value of the land, plus the impact of the transmission line on the farming operation. Compensation for an easement is based on 75 percent of the market value of the land to cover the basic right-of-way. An additional payment is made for any tower structures required, reflecting such factors as the market value of land, loss of revenue from crop production and for any increased operating costs caused by the inconvenience of working around the structures. This takes into account the area of unworkable land, weed control, and the required manoeuvring of farm machinery for such operations as cultivating, seeding, spraying, fertilizing, mowing and harvesting. Compensation for the first structure is based on 31 percent of the market value of one hectare of land. This compensation is increased by 2 percent for each additional structure to cover the accumulative effect of the additional structures. For example, compensation for the second structure is 33 percent of the value of one hectare of land, 35 percent for the third structure, and so on. Minimum payment for one structure is $100.

An allowance for injurious affection to remaining lands is included in the easement compensation, and is paid at the time of the deal. The amount is based on the injurious affection appraised in the purchase option when it occurs, subject to adjustment to recognize individual and exceptional circumstances.

An owner can choose an annual payment for an easement over agricultural lands instead of a lump sum. The annual amount is determined by applying the chartered bank prime interest rate plus 1 percent as established on January 1 of the current year, to the total of the easement value and structure compensation. For example, if the current chartered bank prime rate is 9 percent, then the current annual payment will be 10 percent of the said total. This payment will be re-assessed periodically as follows: the interest rate to be used will be established on January 1 of each year after the initial payment. The value of the easement, based on the market value of the land, will be reviewed every five years. Thus, the annual payment will continue to relate to current land values and interest rates.

Purchase (Full Title)
In the case of the purchase of a right-of-way, the Act makes provision for the payment of allowances such as disturbance and legal and survey costs when applicable, as well as the market value of the land and any injurious affection. Hydro recognizes the special impact a transmission line may have on a farm operation and is prepared to make an additional allowance of up to 25 percent of the total purchase price for this disturbance.

Under certain circumstances, both owner and Hydro may agree that it is appropriate for Hydro to buy an entire property. This could apply, for example, where an owner's residence or main buildings are involved. It is also recognized that, in certain cases, an owner may not wish to remain on the property as a result of the substantial effect on the agricultural property by the transmission line corridor. In such cases, if Ontario Hydro or a panel of mutually selected agricultural experts agree that the economic viability of the property has been undermined, then Ontario Hydro will buy the property in its entirety. The owner is given three years from the date of completion of construction (in-service date of facilities) to exercise the option of selling the entire property outright and relocating. When the entire property is purchased, requiring an owner to move, further allowances will be included in the offer, based on estimates obtained, covering reasonable moving and relocation costs."